Mehrstufengetriebe

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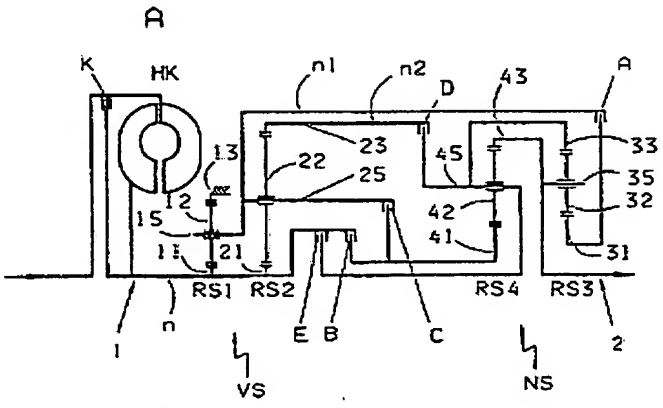
The invention relates to a multi-step gear comprising at least 7 forward gears wherein two non-shiftable control gear sets (RS1, RS2) are provided at the drive shaft (1), which generate two revolution speeds (n1, n2) at the output side, which can be selectively switched to a secondary gear shift assembly (RS3, RS4) acting upon the output shaft (2) by selective shut-down of the switching elements (A, B, C; D) in such a way that only one shifting element has to be shut down and one additional shifting element turned on to shift from one gear to the next higher or lower gear.



B

CLOSED CIRCUIT ELEMENTS
GESCHLOSSENE SCHALTELEMENTE

GANG GEAR	SCHALTELEMENT CIRCUIT ELEMENT A	B	C	D	E	UEBERSETZUNG TRANSMISSION	GANGSPRUNG (SPREIZUNG 9.15) x
1			o	o		7.23	1.86
2	o			o		3.88	1.41
3	o		o			2.75	1.65
4	o	o				1.67	1.31
5	o				o	1.27	1.27
6		o			o	1	1.26
7			o		o	0.79	
R		o		o		-7.88	

STANDUEBERSETZUNGEN TRANSMISSION
IO(RS3) = -2.0
IO(RS4) = -2.4
IO(RS1) = -1.75
IO(RS2) = -4.0

x ... GEAR SHIFT (GEAR RATIO)

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]
The input shaft (1) combined with the front-end gearing set (VS), and the output shaft combined with the postposing gearing set (NS) which consists of a connected epicyclic gear set (PS3, PS4) which can switch two pieces (2), In the multistage change gear which has a shift element (A thru/or H) and can transmit alternatively the rotational frequency of an input shaft (1), and the rotational frequency of a front-end gearing set (VS) to a postposing gearing set (NS) by alternative connection of a shift element (A thru/or H) for a gear change A front-end gearing set (VS) consists of a connected epicyclic gear set (RS1, RS2) which cannot switch two pieces. Two epicyclic gear sets (RS1, RS2) generate two rotational frequencies (n1, n2) in an output side. By alternative conclusion of a shift element (A thru/or F), besides the input rotational frequency (n) of an input shaft (1) these rotational frequencies (n1, n2) In order to be able to connect at least with one side of the epicyclic gear set (RS3, RS4) in which two changes of the postposing gearing set (NS) which acts on an output shaft (2) are possible alternatively and to switch to a high or gear ratio low next next from a certain gear ratio The multistage change gear characterized by cutting only the shift element which is one side between two shift elements then operated, respectively, connecting the shift element of another side, and forming at least seven ahead stages.
[Claim 2]
The multistage change gear according to claim 1 with which the number of ahead stages is characterized by only at least 2 being larger than the number of shift elements (A thru/or F).
[Claim 3]
The 1st epicyclic gear set (RS1) and the 2nd epicyclic gear set (RS2) which constitute the 2 carrier 4 shaft gear which cannot be switched as front-end gearing sets (VS) are prepared. One [at least] shaft rotates at the input rotational frequency (n) of an input shaft (1), and another shaft is being fixed. The multistage change gear according to claim 1 or 2 characterized by being the 2 carrier 4 shaft gear which the postposing gearing set (NS) which can be switched becomes from the 3rd epicyclic gear set (RS3) and the 4th epicyclic gear set (RS4), and which can be switched.
[Claim 4]
The sun gear (11) of the 1st epicyclic gear set (RS1) and the sun gear (21) of the 2nd epicyclic gear set (RS2) are arranged by the input shaft (1). The ring wheel (13) of the 1st epicyclic gear set (RS1) is fixed. The planet carrier (15) of the epicyclic gear (12) of the 1st epicyclic gear set (RS1) is combined with the planet carrier (25) of the epicyclic gear (22) of the 2nd epicyclic gear set (RS2). The ring wheel (23) of the 2nd epicyclic gear set (RS2) is combinable with the ring wheel (33) of the 3rd epicyclic gear set (RS3) with the 4th shift element (D). The ring wheel (33) of the 3rd epicyclic gear set (RS3) is combined with the planet carrier (45) of the epicyclic gear (42) of the 4th epicyclic gear set (RS4). The planet carrier (15) of the 1st epicyclic gear set (RS1) is combinable with the sun gear (31) of the 3rd epicyclic gear set (RS3) with the 1st shift element (A). The planet carrier (25) of the 2nd epicyclic gear set (RS2) is combinable with the sun gear (41) of the 4th epicyclic gear set (RS4) with the 3rd shift element (C). The planet carrier (35) of the epicyclic gear (32) of the 3rd epicyclic gear set (RS3) is combined with the ring wheel (43) of the 4th epicyclic gear set (RS4), and the output shaft (2). An input shaft (1) with the 2nd shift element (B) The sun gear of the 4th epicyclic gear set (RS4) (41), Moreover, the multistage change gear according to claim 1, 2, or 3 characterized by being combinable with the planet carrier (45) of the 4th epicyclic gear set (RS4) with the 5th shift element (E) (drawing 1 A).
[Claim 5]
An input shaft (1) is combined with the ring wheel (21) of the sun gear (11) of the 1st epicyclic gear set

(RS1), and the 2nd epicyclic gear set (RS2). The planet carrier (25) of the epicyclic gear (22) of the 2nd epicyclic gear set (RS2) is fixed. And it is combined with the ring wheel (13) of the 1st epicyclic gear set (RS1). An input shaft (1) is combinable with the sun gear (31) of the 3rd epicyclic gear set (RS3) with the 1st shift element (A). Moreover, are combinable with the planet carrier (45) of the epicyclic gear (42) of the 4th epicyclic gear set (RS4) with the 5th shift element (E). The planet carrier (45) of the 4th epicyclic gear set (RS4) is combined with the ring wheel (33) of the 3rd epicyclic gear set (RS3). The ring wheel (33) of the 3rd epicyclic gear set (RS3) combined with the planet carrier (45) of the 4th epicyclic gear set (RS4) and this is fixable with the 4th shift element (D). The ring wheel (23) of the 2nd epicyclic gear set (RS2) is combinable with the sun gear (41) of the 4th epicyclic gear set (RS4) with the 3rd shift element (C). The planet carrier (15) of the epicyclic gear (12) of the 1st epicyclic gear set (RS1) is combinable with the sun gear (41) of the 4th epicyclic gear set (RS4) with the 2nd shift element (B). The multistage change gear according to claim 1, 2, or 3 characterized by combining the ring wheel (42) of the 4th epicyclic gear set (RS4) with the planet carrier (35) of the epicyclic gear (32) of the 3rd epicyclic gear set (RS3), and the output shaft (2) (drawing 2 A).

[Claim 6]

An input shaft (1) is combined with the sun gear (11) of the 1st epicyclic gear set (RS1). The planet carrier (15) of the epicyclic gear (12) of the 1st epicyclic gear set (RS1) is combined with the planet carrier (25") of the outside epicyclic gear (22") of the 2nd epicyclic gear set (RS2), and the planet carrier (25') of an inside epicyclic gear (22'). The epicyclic gear (12) of the 1st epicyclic gear set (RS1) is connected with the outside epicyclic gear (22") of the 2nd epicyclic gear set (RS2). The ring wheel (13) of the 1st epicyclic gear set (RS1) is combined with the ring wheel (23) of the 2nd epicyclic gear set (RS2). The ring wheel (13) of the 1st epicyclic gear set (RS1) is fixed. The 3rd epicyclic gear set The planet carrier (35") of the outside epicyclic gear (32") of (RS3) is combined with the planet carrier (35') of the inside epicyclic gear (32') of the 3rd epicyclic gear set (RS3), and the planet carrier (45) of the epicyclic gear (42) of the 4th epicyclic gear set (RS4). two planet carriers (35' --) of the 3rd epicyclic gear set (RS3) The planet carrier (45) of the 4th epicyclic gear set (RS4) combined with 35" and this is fixable with the 4th shift element (D). An input shaft (1) is combinable with the sun gear (31) of the 3rd epicyclic gear set (RS3) with the 1st shift element (A). an input shaft (1) -- the 5th shift element (E) -- the planet carrier (35' --) of the 3rd epicyclic gear set (RS3) Are combinable with the planet carrier (45) of the 4th epicyclic gear set (RS4) combined with 35" and this. The epicyclic gear (42) of the 4th epicyclic gear set (RS4) is connected with the outside epicyclic gear (32") of the 3rd epicyclic gear set (RS3). The sun gear (21) of the 2nd epicyclic gear set (RS2) is combinable with the sun gear (41) of the 4th epicyclic gear set (RS4) with the 3rd shift element (C). two planet carriers (25' --) of the 2nd epicyclic gear set (RS2) combined with the planet carrier (15) of the 1st epicyclic gear set (RS1), and this 25" is combinable with the sun gear (41) of the 4th epicyclic gear set (RS4) with the 2nd shift element (B). The multistage change gear according to claim 1, 2, or 3 characterized by combining with the output shaft (2) the ring wheel (43) of the 4th epicyclic gear set (RS4) connected with the ring wheel (33) of the 3rd epicyclic gear set (RS3), and this (drawing 3 A).

[Claim 7]

The epicyclic gear (12) of the 1st epicyclic gear set (RS1) is connected with the epicyclic gear (22) of the 2nd epicyclic gear set (RS2). The sun gear (11) of the 1st epicyclic gear set (RS1) is fixed, and the planet carrier (15) of the epicyclic gear (12) of the 1st epicyclic gear set (RS1) and the planet carrier (25) of the epicyclic gear (22) of the 2nd epicyclic gear set (RS2) are combined mutually. The input shaft (1) is combined with the ring wheel (13) of the 1st epicyclic gear set (RS1), and the ring wheel (23) of the 2nd epicyclic gear set (RS2). The sun gear (21) of the 2nd epicyclic gear set (RS2) is combinable with the planet carrier (45) of the epicyclic gear (42) of the 4th epicyclic gear set (RS4) with the 4th shift element (D). The planet carrier (25) of the 2nd epicyclic gear set (RS2) combined with the planet carrier (15) of the 1st epicyclic gear set (RS1) and this is combinable with the ring wheel (43) of the 4th epicyclic gear set (RS4) with the 3rd shift element (C). An input shaft (1) is combinable with the ring wheel (43) of the 4th epicyclic gear set (RS4) with the 2nd shift element (B). An input shaft (1) is combinable with the ring wheel (33) of the 3rd epicyclic gear set (RS3) with the 5th shift element (E). The ring wheel (33) of the 3rd epicyclic gear set (RS3) is combined with the planet carrier (45) of the 4th epicyclic gear set (RS4). The planet carrier (35) of the epicyclic gear (32) of the 3rd epicyclic gear set (RS3) is combined with an output shaft (2). The multistage change gear according to claim 1, 2, or 3 characterized by combining mutually the sun gear (31) of the 3rd epicyclic gear set (RS3), and the sun gear (41) of the 4th epicyclic gear set (RS4), and being able to fix with the 1st shift element (A) (drawing 4 A).

[Claim 8]

An input shaft (1) is combined with the sun gear (11) of the 1st epicyclic gear set (RS1). The sun gear (11) of the 1st epicyclic gear set (RS1) is combined with the sun gear (21) of the 2nd epicyclic gear set (RS2). The ring wheel (13) of the 1st epicyclic gear set (RS1) is fixed. The planet carrier (15) of the epicyclic gear (12) of the 1st epicyclic gear set (RS1) is combined with the planet carrier (25) of the epicyclic gear (22) of the 2nd epicyclic gear set (RS2). The ring wheel (23) of the 2nd epicyclic gear set (RS2) is combinable with the planet carrier (45) of the 4th epicyclic gear set (RS4) with the 4th shift element (D). The planet carrier (45) of the 4th epicyclic gear set (RS4) is combined with the ring wheel (33) of the 3rd epicyclic gear set (RS3). An input shaft (1) is combinable with the sun gear (41) of the 4th epicyclic gear set (RS4) combined with the sun gear (31) of the 3rd epicyclic gear set (RS3), and this with the 1st shift element (A). An input shaft (1) is combinable with the ring wheel (33) of the 3rd epicyclic gear set (RS3) combined with the planet carrier (45) of the 4th epicyclic gear set (RS4), and this with the 5th shift element (E). The planet carrier (25) of the 2nd epicyclic gear set (RS2) combined with the planet carrier (15) of the 1st epicyclic gear set (RS1) and this is combinable with the ring wheel (43) of the 4th epicyclic gear set (RS4) with the 2nd shift element (B). The ring wheel (43) of the 4th epicyclic gear set (RS4) is fixable with the 3rd shift element (C). The multistage change gear according to claim 1, 2, or 3 characterized by combining the planet carrier (35) of the epicyclic gear (32) of the 3rd epicyclic gear set (RS3) with the output shaft (2) (drawing 5 A).
[Claim 9]
An input shaft (1) is combined with the ring wheel (13) of the 1st epicyclic gear set (RS1). The ring wheel (13) of the 1st epicyclic gear set (RS1) is combined with the ring wheel (23) of the 2nd epicyclic gear set (RS2). The sun gear (11) of the 1st epicyclic gear set (RS1) is fixed, and the planet carrier (15) of the epicyclic gear (12) of the 1st epicyclic gear set (RS1) is combined with the planet carrier (25) of the epicyclic gear (22) of the 2nd epicyclic gear set (RS2). The sun gear (21) of the 2nd epicyclic gear set (RS2) is combinable with the planet carrier (35') of the inside epicyclic gear (32') of the 3rd epicyclic gear set (RS3) with the 4th shift element (D). The planet carrier (35') of the inside epicyclic gear (32') of the 3rd epicyclic gear set (RS3) is combined with the planet carrier (35") of the outside epicyclic gear (32") of the 3rd epicyclic gear set (RS3). The outside epicyclic gear (32") of the 3rd epicyclic gear set (RS3) is connected with the epicyclic gear (42) of the 4th epicyclic gear set (RS4). The planet carrier (25) of the 2nd epicyclic gear set (RS2) is combinable with the sun gear (31) of the 3rd epicyclic gear set (RS3) with the 1st shift element (A). An input shaft (1) is combinable with the planet carrier (35') of the 3rd epicyclic gear set (RS3), and a planet carrier (35") with the 5th shift element (E). The sun gear (21) of the 2nd epicyclic gear set (RS2) is combinable with the sun gear (41) of the 4th epicyclic gear set (RS4) with the 6th shift element (F). The planet carrier (15) of the 1st epicyclic gear set (RS1) and the planet carrier (25) of the 2nd epicyclic gear set (RS2) are combinable with the sun gear (41) of the 4th epicyclic gear set (RS4) with the 2nd shift element (B). The sun gear (41) of the 4th epicyclic gear set (RS4) is fixable with the 3rd shift element (C). The multistage change gear according to claim 1, 2, or 3 characterized by combining the ring wheel (33) of the 3rd epicyclic gear set (RS3) with the ring wheel (43) of the 4th epicyclic gear set (RS4), and the output shaft (2) (drawing 6 A).
[Claim 10]
An input shaft (1) is combined with the ring wheel (13) of the 1st epicyclic gear set (RS1). The planet carrier (15) of the epicyclic gear (12) of the 1st epicyclic gear set (RS1) is combined with the planet carrier (25) of the epicyclic gear (22) of the 2nd epicyclic gear set (ES2). The ring wheel (13) of the 1st epicyclic gear set (RS1) is combined with the ring wheel (23) of the 2nd epicyclic gear set (RS2). The sun gear (11) of the 1st epicyclic gear set (RS1) is being fixed. An input shaft (1) is combinable with the planet carrier (45) of the epicyclic gear (42) of the 4th epicyclic gear set (RS4) with the 5th shift element (E). The planet carrier (45) is combined with the ring wheel (33) of the 3rd epicyclic gear set (RS3). An input shaft (1) is combinable with the sun gear (41) of the 4th epicyclic gear set (RS4) with the 2nd shift element (B). The planet carrier (15) of the 1st epicyclic gear set (RS1) and the planet carrier (25) of the 2nd epicyclic gear set (RS2) are combinable with the sun gear (31) of the 3rd epicyclic gear set (RS3) with the 1st shift element (A). Moreover, are combinable with the sun gear (41) of the 4th epicyclic gear set (RS4) with the 6th shift element (F). The sun gear (21) of the 2nd epicyclic gear set (RS2) is combinable with the sun gear (41) of the 4th epicyclic gear set (RS4) with the 3rd shift element (C). Moreover, are combinable with the ring wheel (33) of the planet carrier (45) of the 4th epicyclic gear set (RS4), and the 3rd epicyclic gear set (RS3) with the 4th shift element (D). The multistage change gear according to claim 1, 2, or 3 characterized by combining the ring wheel (43) of the 4th epicyclic gear set (RS4) with the planet carrier (35) of the epicyclic gear (32) of the 3rd epicyclic gear set (RS3), and the output shaft (2) (drawing 7 A).
[Claim 11]

An input shaft (1) is combined with the planet carrier (15') of the sun gear (21) of the 2nd epicyclic gear set (RS2), and the inside epicyclic gear (12') of the 1st epicyclic gear set (RS1). The planet carrier (15') of the inside epicyclic gear (12') of the 1st epicyclic gear set (RS1) is combined with the planet carrier (15") of the outside epicyclic gear (12") of the 1st epicyclic gear set (RS1). The planet carrier (25) of the epicyclic gear (22) of the 2nd epicyclic gear set (RS2) is fixed. And it is combined with the sun gear (11) of the 1st epicyclic gear set (RS1). An input shaft (1) is combinable with the sun gear (31) of the 3rd epicyclic gear set (RS3) with the 1st shift element (A). The ring wheel (23) of the 2nd epicyclic gear set (RS2) is combinable with the sun gear (41) of the 4th epicyclic gear set (RS4) with the 3rd shift element (C). The ring wheel (13) of the 1st epicyclic gear set (RS1) is combinable with the sun gear (41) of the 4th epicyclic gear set (RS4) with the 2nd shift element (B). An input shaft (1) is combinable with the planet carrier (45) of the epicyclic gear (42) of the 4th epicyclic gear set (RS4) with the 5th shift element (E). The planet carrier (45) of the 4th epicyclic gear set (RS4) is combined with the ring wheel (33) of the 3rd epicyclic gear set (RS3). It can fix with the 4th shift element (D), and the sun gear (41) of the 4th epicyclic gear set (RS4) can be fixed with the 6th shift element (F). The multistage change gear according to claim 1, 2, or 3 characterized by combining the ring wheel (43) of the 4th epicyclic gear set (RS4) with the planet carrier (35) of the epicyclic gear (32) of the 3rd epicyclic gear set (ES3), and the output shaft (2) (drawing 8 A).

[Claim 12]

An input shaft (1) is combined with the sun gear (21) of the 2nd epicyclic gear set (RS2). The outside epicyclic gear (22") of the 2nd epicyclic gear set (RS2) is connected with the epicyclic gear (12) of the 1st epicyclic gear set (RS1). The sun gear (11) of the 1st epicyclic gear set (RS1) is being fixed. An input shaft (1) is combinable with the sun gear (41) of the 4th epicyclic gear set (RS4) with the 2nd shift element (B). Moreover, are combinable with the planet carrier (45) of the epicyclic gear (42) of the 4th epicyclic gear set (RS4) with the 5th shift element (E). A planet carrier (45) is combined with the ring wheel (33) of the 3rd epicyclic gear set (RS3). The outside epicyclic gear of the 2nd epicyclic gear set (RS2) (22") And the planet carrier (15) common to the epicyclic gear (12) of the 1st epicyclic gear set (RS1) is combined with the planet carrier (25') of the inside epicyclic gear (22') of the 2nd epicyclic gear set (RS2). Are combinable with the sun gear (41) of the 4th epicyclic gear set (RS4) with the 6th shift element (F). The ring wheel (13) of the 1st epicyclic gear set (RS1) is combined with the ring wheel (23) of the 2nd epicyclic gear set (RS2). Are combinable with the planet carrier (45) of the 4th epicyclic gear set (RS4) with the 4th shift element (D). Moreover, are combinable with the sun gear (41) of the 4th epicyclic gear set (RS4) with the 3rd shift element (C). A planet carrier (15) common to the outside epicyclic gear (22') of the 2nd epicyclic gear set (RS2) and the epicyclic gear (12) of the 1st epicyclic gear set (RS1) is combinable with the sun gear (31) of the 3rd epicyclic gear set (RS3) with the 1st shift element (A). The multistage change gear according to claim 1, 2, or 3 characterized by combining the ring wheel (43) of the 4th epicyclic gear set (RS4) with the planet carrier (35) of the epicyclic gear (32) of the 3rd epicyclic gear set (RS3), and the output shaft (2) (drawing 15 A).

[Claim 13]

A front-end gearing set (VS) becomes an output side from the epicyclic gear set (RS1) with which a rotational frequency (n1) is generated and which cannot be switched. By alternative conclusion of a shift element (A thru/or F), besides the input rotational frequency (n) of an input shaft a rotational frequency (n1) It connects at least with one side of two epicyclic gear sets (RS3, RS4) of the postposing gearing set (NS) which acts on an output shaft (2) alternatively. Next for a gear change in a high or stage low next, respectively Only the shift element which is one side between two shift elements then operated, respectively is cut. The multistage change gear based on the superordinate concept of claim 1 to which another shift element is connected, at least seven ahead stages are constituted in that case, and the number of ahead stages is characterized by only at least 2 being larger than the number of shift elements.

[Claim 14]

The sun gear (11) of a front-end epicyclic gear set (RS1) is combined with an input shaft (1). The planet carrier (15') of the inside epicyclic gear (12') of a front-end epicyclic gear set (RS1) is fixed. And it is combined with the planet carrier (15") of the outside epicyclic gear (12") of a front-end epicyclic gear set (RS1). An input shaft (1) is combinable with the planet carrier (45) of the 2nd postposing epicyclic gear set (RS4) with the 5th shift element (E). The 2nd postposing epicyclic gear set The planet carrier (45) of (RS4) is combined with the planet carrier (35') of the inside epicyclic gear (32') of the 1st postposing epicyclic gear set (RS3), and the planet carrier (35") of the outside epicyclic gear (32") of the 1st postposing epicyclic gear set (RS3). It can fix with the 4th shift element (D), and an input shaft (1) can be combined with the sun gear (41) of the 2nd postposing epicyclic gear set (RS4) with the 2nd shift element (B). The planet carrier (15') of

the inside epicyclic gear (12') of a front-end epicyclic gear set (RS1) and the planet carrier (15") of an outside epicyclic gear (12") are combinable with the sun gear (41) of the 2nd postposing epicyclic gear set (RS4) with the 3rd shift element (C). The ring wheel (13) of a front-end epicyclic gear set (RS1) is combinable with the sun gear (41) of the 2nd postposing epicyclic gear set (RS4) with the 6th shift element (F). Moreover, are combinable with the sun gear (31) of the 1st postposing epicyclic gear set (RS3) with the 1st shift element (A). The ring wheel (43) of the 2nd postposing epicyclic gear set (RS4) is combined with the ring wheel (33) of the 1st postposing epicyclic gear set (RS3), and an output shaft (2). The multistage change gear according to claim 13 characterized by connecting mutually the outside epicyclic gear (32") of the 1st postposing epicyclic gear set (RS3), and the epicyclic gear (42) of the 2nd postposing epicyclic gear set (RS4) (drawing 9 A).

[Claim 15]

The sun gear (11) of a front-end epicyclic gear set (RS1) is combined with an input shaft (1). The ring wheel (13) of a front-end epicyclic gear set (RS1) is being fixed. An input shaft (1) is combinable with the sun gear (31) of the 1st postposing epicyclic gear set (RS3) with the 1st shift element (A). Moreover, are combinable with the planet carrier (45) of the epicyclic gear (42) of the 2nd postposing epicyclic gear set (RS4) with the 5th shift element (E). The planet carrier (45) of the 2nd postposing epicyclic gear set (RS4) is combined with the ring wheel (33) of the 1st postposing epicyclic gear set (RS3). The planet carrier (45) of the 2nd postposing epicyclic gear set (RS4), and the ring wheel (33) of the 1st postposing epicyclic gear set (RS3) with the 4th shift element (D) Are combinable with the planet carrier (15) of the epicyclic gear (12) of a front-end epicyclic gear set (RS1). The sun gear (41) of the 2nd postposing epicyclic gear set (RS4) is fixable with the 3rd shift element (C). The planet carrier (15) of the epicyclic gear (12) of a front-end epicyclic gear set (RS1) is combinable with the sun gear (41) of the 2nd postposing epicyclic gear set (RS4) with the 2nd shift element (B). The multistage change gear according to claim 13 characterized by combining the ring wheel (43) of the 2nd postposing epicyclic gear set (RS4) with the planet carrier (35) of the epicyclic gear (32) of the 1st postposing epicyclic gear set (RS3), and the output shaft (2) (drawing 12 A).

[Claim 16]

The sun gear (11) of a front-end epicyclic gear set (RS1) is combined with an input shaft (1). The planet carrier (15') of the inside epicyclic gear (12') of a front-end epicyclic gear set (RS1) and the planet carrier (15") of an outside epicyclic gear (12") are combined mutually. And it is fixed. The 1st postposing epicyclic gear set The inside epicyclic gear of (RS3) The planet carrier (35') of (32') is combined with the planet carrier (35") of the outside epicyclic gear (32") of the 1st postposing epicyclic gear set (RS3), and the planet carrier (45) of the epicyclic gear (42) of the 2nd postposing epicyclic gear set (RS4). the planet carrier (35' --) with which the 1st and 2nd postposing epicyclic gear sets (RS3, RS4) were combined 35' and 45 are combinable with the ring wheel (13) of a front-end epicyclic gear set (RS1) with the 4th shift element (D). An input shaft (1) is combinable with the sun gear (31) of the 1st postposing epicyclic gear set (RS3) with the 1st shift element (A). the planet carrier (35" --) with which the 1st and 2nd postposing epicyclic gear sets (RS3, RS4) were combined with the 5th shift element (E) in the input shaft (1) It can combine with 35' and 45 and the sun gear (41) of the 2nd postposing epicyclic gear set (RS4) can be fixed with the 3rd shift element (C). The ring wheel (13) of a front-end epicyclic gear set is combinable with the sun gear (41) of the 2nd postposing epicyclic gear set (RS4) with the 2nd shift element (B). The multistage change gear according to claim 13 characterized by combining with the output shaft (2) the ring wheel (43) of the 2nd postposing epicyclic gear set (RS4) connected with the ring wheel (33) of the 1st postposing epicyclic gear set (RS3), and this (drawing 13 A).

[Claim 17]

The ring wheel (13) of a front-end epicyclic gear set (RS1) is combined with an input shaft (1). The sun gear (11) of a front-end epicyclic gear set (RS1) is being fixed. An input shaft (1) is combinable with the planet carrier (45) of the epicyclic gear (42) of the 2nd postposing epicyclic gear set (RS4) with the 5th shift element (E). The planet carrier (45) is combined with the sun gear (31) of the 1st postposing epicyclic gear set (RS3). Are combinable with the ring wheel (33) of the 1st postposing epicyclic gear set (RS3) with the 1st shift element (A). The ring wheel (33 43) of the 1st and 2nd postposing epicyclic gear sets (RS3, RS4) is combined mutually. The planet carrier (15) of a front-end epicyclic gear set (RS1) is combinable with the sun gear (41) of the 2nd postposing epicyclic gear set (RS4) with the 2nd shift element (B). Moreover, are combinable with the planet carrier (45) of the 2nd postposing epicyclic gear set (RS4) with the 4th shift element (D). The multistage change gear according to claim 13 characterized by combining the planet carrier (35) of the epicyclic gear (32) of the 1st postposing epicyclic gear set (RS3) with the output shaft (2)

(drawing 14 A).
[Claim 18]
the connected star gearing set (RS1 and RS2a --) which a front-end gearing set (VS) cannot switch [three] It consists of RS2b and three epicyclic gear sets (RS1, RS2a, RS2b) are three rotational frequencies (it nl(s)) to an output side. n2a and n2b -- generating -- alternative conclusion of a shift element (A thru/or G) -- the rotational frequency (it nl(s)) of the above besides the input rotational frequency (n) of an input shaft (1) n2a and n2b are connected to at least one of the epicyclic gear sets (RS3, RS4) in which two changes of the postposing epicyclic gear set (NS) which acts on an output shaft (2) are possible. Next, for a gear change in a high or stage low next The multistage change gear based on the superordinate concept of claim 1 characterized by cutting only the shift element which is one side among the shift elements of two having operated it then, respectively, connecting another shift element, and constituting at least seven ahead stages.
[Claim 19]
The multistage change gear according to claim 18 with which the number of ahead stages is characterized by only at least 2 being larger than the number of shift elements (A thru/or G).
[Claim 20]
As a front-end gearing set (VS), the 1st front-end epicyclic gear set (RS1), The 2nd front-end epicyclic gear set (RS2) and the 3rd front-end epicyclic gear set (RS3) are prepared. These epicyclic gear sets constitute the 3 carrier 5 shaft gear which cannot be switched. At least one shaft rotates at the rotational frequency (n) of an input shaft (1), and at least one another shaft is being fixed. The multistage change gear according to claim 18 or 19 characterized by being the 2 carrier 4 shaft gear which the postposing gear (NS) which can be switched turns into from the 1st postposing epicyclic gear set (RS3) and the 2nd postposing epicyclic gear set (RS4), and which can be switched.
[Claim 21]
The 1st front-end epicyclic gear set (RS1) is combined with an input shaft (11). The outside epicyclic gear (22b") of the 3rd front-end epicyclic gear set (RS2b) and the epicyclic gear (22a) of the 2nd front-end epicyclic gear set (RS2a) are connected mutually. The 2nd front-end epicyclic gear set A planet carrier (25b") common to the epicyclic gear (22a) of (RS2a) and the outside epicyclic gear (22b") of the 3rd front-end epicyclic gear set (RS2b) The planet carrier of the inside epicyclic gear (22b') of the 3rd front-end epicyclic gear set (RS2b) (25b') And it is combined with the planet carrier (15) of the epicyclic gear (12) of the 1st front-end epicyclic gear set (RS1). The ring wheel (13) of the 1st front-end epicyclic gear set (RS1) and the sun gear (21b) of the 3rd front-end epicyclic gear set (RS2b) are being fixed. The ring wheel (23a) of the 2nd front-end epicyclic gear set (RS2a), and the ring wheel (23b) of the 3rd front-end epicyclic gear set (RS2b) with the 4th shift element (D) Are combinable with the planet carrier (45) of the epicyclic gear (42) of the 2nd postposing epicyclic gear set (RS4). The planet carrier (45) of the 2nd postposing epicyclic gear set (RS4) is combined with the ring wheel (33) of the 1st postposing epicyclic gear set (RS3). The ring wheel (23a) of the 2nd front-end epicyclic gear set (RS2a) and the ring wheel (23b) of the 3rd front-end epicyclic gear set (RS2b) are combinable with the ring wheel (43) of the 2nd postposing epicyclic gear set (RS4) with the 6th shift element (F). An input shaft (1) is combinable with the sun gear (31) of the 1st postposing epicyclic gear set (RS3) combined with the sun gear (41) of the 2nd postposing epicyclic gear set (RS4), and this with the 1st shift element (A). Moreover, are combinable with the planet carrier (45) of the 2nd postposing epicyclic gear set (RS4) with the 5th shift element (E). The ring wheel (43) of the 2nd postposing epicyclic gear set (RS4) is fixable with the 3rd shift element (C). The sun gear (21a) of the 2nd front-end epicyclic gear set (RS2a) is combinable with the ring wheel (43) of the 2nd postposing epicyclic gear set (RS4) with the 2nd shift element (B). A planet carrier (25") common to the epicyclic gear (22a) of the 2nd front-end epicyclic gear set (RS2a), and the outside epicyclic gear (22b") of the 3rd front-end epicyclic gear set (RS2b) with the 7th shift element (G) Are combinable with the ring wheel (43) of the 2nd postposing epicyclic gear set (RS4). The multistage change gear according to claim 18, 19, or 20 characterized by combining the planet carrier (35) of the epicyclic gear (32) of the 1st postposing epicyclic gear set (RS3) with the output shaft (2) (drawing 10 A).
[Claim 22]
the connected epicyclic gear set (RSa1 and RS1b --) which a front-end gearing set (VS) cannot switch [at least four] from RS2a and RS2b -- becoming -- these epicyclic gear sets -- an output side -- four rotational frequencies (n1a --) n1b, n2a, and n2b -- generating -- alternative conclusion of a shift element (A thru/or H) -- the rotational frequency (it nla(s)) of the above besides the input rotational frequency (n) of an input shaft (1) n1b, n2a, and n2b are connected to at least one of the epicyclic gear sets (RS3, RS4) in which two changes of the postposing epicyclic gear set (NS) which acts on an output shaft (2) are possible. Next, the

multistage change gear based on the superordinate concept of claim 1 characterized by cutting only the shift element which is one side among the shift elements of two having operated it then, respectively, connecting another shift element, and constituting at least seven ahead stages for a gear change in a high or stage low next.

[Claim 23]

The multistage change gear according to claim 22 with which the number of ahead stages is characterized by only at least 2 being larger than the number of shift elements (A thru/or H).

[Claim 24]

As a front-end set (VS), the 1st front-end epicyclic gear set (RS1a), The 2nd front-end epicyclic gear set (RS1b), the 3rd front-end epicyclic gear set (RS2a), and the 4th front-end epicyclic gear set (RS2b) are prepared. These epicyclic gear sets constitute the 4 carrier 6 shaft gear which cannot be switched. At least one shaft rotates at the input rotational frequency (n) of an input shaft (1), and at least one another shaft is being fixed. The multistage change gear according to claim 22 or 23 characterized by being the 2 carrier 4 shaft gear which the postposing gear (NS) which can be switched turns into from the 1st postposing epicyclic gear set (RS3) and the 2nd postposing epicyclic gear set (RS4), and which can be switched.

[Claim 25]

The epicyclic gear (12a) of the 1st front-end epicyclic gear set (RS1a) is connected with the outside epicyclic gear (12b") of the 2nd front-end epicyclic gear set (RS1b). The 1st front-end epicyclic gear set A planet carrier (15b") common to the epicyclic gear (12a) of (RS1a) and the outside epicyclic gear (12b") of the 2nd front-end epicyclic gear set (RS1b) is combined with the planet carrier (15b') of the inside epicyclic gear (12b') of the 2nd front-end epicyclic gear set (RS1b). The epicyclic gear (22a) of the 3rd front-end epicyclic gear set (RS2a) is connected with the outside epicyclic gear (22b") of the 4th front-end epicyclic gear set (RS2b). The 3rd front-end epicyclic gear set A planet carrier (25b") common to the epicyclic gear (22a) of (RS2a) and the outside epicyclic gear (22b") of the 4th front-end epicyclic gear set (RS2b) is combined with the planet carrier (25b') of the inside epicyclic gear (22b') of the 4th front-end epicyclic gear set (RS2b). Moreover, it is combined with the planet carrier (15b") common to the epicyclic gear (12a) of the 1st front-end epicyclic gear set (RS1a), and the outside epicyclic gear (12b") of the 2nd front-end epicyclic gear set (RS1b). An input shaft (1) is combined with the sun gear (11b) of the 2nd front-end epicyclic gear set (RS1b), and the sun gear (21a) of the 3rd front-end epicyclic gear set (RS2a). The sun gear (11a) of the 1st front-end epicyclic gear set (RS1a) is fixed. The ring wheel (13a) of the 1st front-end epicyclic gear set (RS1a) is combined with the ring wheel (13b) of the 2nd front-end epicyclic gear set (RS2b). Are combinable with the sun gear (41) of the 2nd postposing epicyclic gear set (RS4) with the 2nd shift element (B). An input shaft (1) is combinable with the sun gear (31) of the 1st postposing epicyclic gear set (RS3) with the 1st shift element (A). Moreover, are combinable with the ring wheel (33) of the 1st postposing epicyclic gear set (RS3) with the 5th shift element (E). The ring wheel (33) is combined with the planet carrier (45) of the epicyclic gear (42) of the 2nd postposing epicyclic gear set (RS4). The sun gear (21b) of the 4th front-end epicyclic gear set (RS2b) is combinable with the ring wheel (33) of the 1st postposing epicyclic gear set (RS3), and the planet carrier (45) of the 2nd postposing epicyclic gear set (RS4) with the 4th shift element (D). Moreover, are combinable with the sun gear (41) of the 2nd postposing epicyclic gear set (RS4) with the 6th shift element (F). The planet carrier (25b") of the outside epicyclic gear (22b") of the 4th front-end epicyclic gear set (RS2b) is combinable with the sun gear (41) of the 2nd postposing epicyclic gear set (RS4) with the 8th shift element (H). The ring wheel (23a) of the 3rd front-end epicyclic gear set (RS2a) is combined with the ring wheel (23b) of the 4th front-end epicyclic gear set (RS2b). Are combinable with the sun gear (41) of the 2nd postposing epicyclic gear set (RS4) with the 7th shift element (G). The sun gear (41) of the 2nd postposing epicyclic gear set (RS4) is fixable with the 3rd shift element (C). Claims 22 and 23 characterized by combining the planet carrier (35) of the epicyclic gear (32) of the epicyclic gear (RS3) of the 1st postposing epicyclic gear set (RS3) with the ring wheel (43) of the 2nd postposing epicyclic gear set (RS4), and the output shaft (2) Or a multistage change gear given in 24 (drawing 11 A).

[Claim 26]

An input shaft (1) is combined with the sun gear (11a) of the 1st front-end epicyclic gear set (RS1a). The outside epicyclic gear of the 1st front-end epicyclic gear set (RS1a) (12a"), The epicyclic gear (12b) of the 2nd front-end epicyclic gear set (RS1b), the epicyclic gear (22a) of the 3rd front-end epicyclic gear set (RS2a), and the epicyclic gear (22b) of the 4th front-end epicyclic gear set (RS2b) shift, and it is formed as **********. The planet carrier (15a') of the inside epicyclic gear (12a') of the 1st front-end epicyclic gear set (RS1a) The planet carrier of the outside epicyclic gear (12a") of the 1st front-end epicyclic gear set

(RS1a) (15a"), The planet carrier of the epicyclic gear (12b) of the 2nd front-end epicyclic gear set (RS1b) (15b), It is combined with the planet carrier (25a) of the epicyclic gear (22a) of the 3rd front-end epicyclic gear set (RS2a), and the planet carrier (25b) of the epicyclic gear (22b) of the 4th front-end epicyclic gear set (RS2b). Are combinable with the sun gear (41) of the 2nd postposing epicyclic gear set (RS4) with the 7th shift element (G). The sun gear (11b) of the 2nd front-end epicyclic gear set (RS1b) is being fixed. The sun gear (41) of the 2nd postposing epicyclic gear set (RS4) is fixable with the 3rd shift element (C). The ring wheel (23a) of the 3rd front-end epicyclic gear set (RS2a) is combinable with the sun gear (41) of the 2nd postposing epicyclic gear set (RS4) with the 8th shift element (H). An input shaft (1) is combinable with the sun gear (31) of the 1st postposing epicyclic gear set (RS3) with the 1st shift element (A). The ring wheel (13a) of the 1st front-end epicyclic gear set (RS1a) and the ring wheel (13b) of the 2nd front-end epicyclic gear set (RS1b) are combined mutually. Are combinable with the sun gear (41) of the 2nd postposing epicyclic gear set (RS4) with the 2nd shift element (B). the planet carrier (15a" --) with which the outside of the 1st front-end epicyclic gear set and the inside epicyclic gear (12a", 12a') were combined 15a' is combinable with the planet carrier (35') of the inside epicyclic gear (32") of the 1st postposing epicyclic gear set (RS3) with the 4th shift element (D). The outside epicyclic gear (32") of the 1st postposing epicyclic gear set (RS3) and the epicyclic gear (42) of the 2nd postposing epicyclic gear set (RS4) are connected mutually. The 1st postposing epicyclic gear set The outside epicyclic gear of (RS3) The planet carrier (35') of the inside epicyclic gear (32') of the 1st postposing epicyclic gear set (RS3) and the planet carrier (45) of the epicyclic gear (42) of the 2nd postposing epicyclic gear set (RS4) are combined for the planet carrier (35") of (32"). Are combinable with an input shaft (1) with the 5th shift element (E). The sun gear (21b) of the 4th front-end epicyclic gear set (RS2b) is combinable with the sun gear (41) of the 2nd postposing epicyclic gear set (RS4) with the 6th shift element (F). The multistage change gear according to claim 22, 23, or 24 characterized by combining the ring wheel (33) of the 1st postposing epicyclic gear set (RS3), and the ring wheel (43) of the 4th postposing epicyclic gear set (RS4) with the output shaft (2) together (drawing 16 A).

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
This invention relates to the multistage change gear based on the superordinate concept of claim 1.
[0002]
This kind of change gear is clear on the Europe patent No. 0434525 specifications. A change gear consists of the double epicyclic gear set and three clutches which were arranged by this alignment to the input shaft each other [in general] arranged by the same axle, the output shaft, and the output shaft, and two shift elements [five] of the form of a brake, and alternative conclusion of these shift elements makes a pair, respectively, and determines the various change gear ratios between an input shaft and an output shaft.
[0003]
A well-known change gear has two power paths, and the 1st element of a double epicyclic gear set is combined with the 1st power path with the 1st clutch. The 2nd element of a double epicyclic gear set fixes to an output shaft, and the 3rd element is combined with the 2nd power path with the 3rd clutch. And it is locked by the 1st brake, and since the 4th element of a double epicyclic gear set is combined with the 1st power path with the 2nd clutch and the 2nd brake brakes, a pair is made between shift means, an alternative shift is guaranteed, and six ahead stages are materialized in this way. in that case, the 1st speed -- the 1st clutch and 1st brake -- the 2nd speed -- the 1st clutch and 2nd brake -- the 3rd speed -- the 1st clutch and 2nd clutch -- with the 1st clutch and 3rd clutch, the 5th speed is shifted with the 2nd clutch and 3rd clutch, and 6 ** are shifted for the 4th speed by the 3rd clutch and 2nd brake. Finally a retreat stage is shifted by the 2nd clutch and 1st brake.
[0004]
Then, the technical problem of this invention is offering the multistage change gear which includes at least seven ahead stages and can be manufactured comparatively cheaply with proper change-gear-ratio spacing and the total big change gear ratio.
[0005]
This technical problem is solved by the multistage change gear in which it has the description of claim 18 with the description of claim 13, and the 3rd solution, and it has the description of claim 22 by the 4th solution in the description of claim 1, and the 2nd solution with the 1st solution.
[0006]
An important advantage is that the multistage change gear concerning this invention has at least seven ahead stages with a small number of gearing set and shift element. In that case, two shift elements are only operated for each [are shifted] stage of every, respectively. When switching to the next stage from a certain stage, one shift element is cut, and one another shift element is only connected. For the shift quality which must operate two or more shift elements to coincidence, a problematic group shift can be carried out in this way, and can be avoided.
[0007]
The suitable operation gestalt of this invention about the multistage change gear which can, if possible, shift the gear ratio of many in a small number of shift element and gearing set as possible and which can be manufactured cheaply is clear at a subordination claim.
[0008]
Next, this invention and its operation gestalt are explained in full detail in relation to drawing.
[0009]
According to each operation gestalt of the multistage change gear concerning this invention, the shift diagram (drawing 1 B thru/or 16B) containing the change gear ratio of a power transfer line route map

(drawing 1 A thru/or 16A) and this ** of each gear ratio, change-gear-ratio spacing, the total change gear ratio, and the quiescence change gear ratio of each epicyclic gear set is shown in drawing.
[0010]
The following consideration brought about invention. Since manufacture constitutes the multistage change gear of seven steps of comparatively cheap advance, and one step of retreat from five shift elements as compared with the advanced technology, two front-end gearing sets which generate two another rotational frequencies n1 and n2 are prepared in an input shaft besides the input rotational frequency n transmitted with an input shaft. In the well-known multistage change gear told to this and a contrast target at the beginning, the only one front-end gearing set which generates another rotational frequency in addition to the input rotational frequency n is only prepared in an input shaft. In this invention, it is transmitted to an output shaft according to the power transfer path in which rotational frequencies n1 and n2 and the input rotational frequency n are shifted by actuation of a shift element. By arranging an auxiliary shift element, this invention multistage change gear of seven steps of advance and one step of retreat is left, and at least one step of various multistage change gears are especially designed for retreat by seven or more steps of advance for a passenger car, a bus, and trucks. The crawling design of special change-gear-ratio spacing can be shown to off-road vehicles. In order to use it by the motorcycle or the bicycle, a multistage change gear without retreat can be shown.
[0011]
Next, in relation to drawing 1 thru/or 5, seven steps of advance which can be switched with five shift elements, and five different transformation of the above-mentioned multistage change gear of one step of retreat are explained. It is good without being able to use in order to substitute an easy liquid clutch for the torque converter regularly used considering the gain of the total change gear ratio obtained by the change gear design based on this invention as compared with the six-step change gear stated to the beginning since the total nine or more change gear ratios are possible as for example, a start element, and giving up the high start capacity of a car moreover.
[0012]
A, B, C, D and E, and the 1st epicyclic gear set of the front-end gearing set VS are expressed with drawing 1 thru/or 5 for 1 and a shift element, and the 1st of RS1 and the postposing gearing set NS which switches [RS2 and] the 2nd epicyclic gear set of the front-end gearing set VS, and the 2nd gearing set are expressed with RS3 or RS4 for an input shaft, respectively.
[0013]
It is common in drawing 1 thru/or all five operation gestalten of 5 that the front-end gearing set RS 1 generates the 1st auxiliary rotational frequency n1, and the 2nd gearing shift set RS 2 other than the input rotational frequency n of an input shaft 1 generates the 2nd auxiliary rotational frequency n2. The shift element of two each is only concluded at every gear change.
[0014]
A front-end gearing set constitutes the 2 carrier 4 shaft gear which cannot be switched, one shaft rotates it at the rotational frequency n of an input shaft 1 by at least one shaft and max for every front-end gearing set, and one shaft is being fixed by at least one shaft and max for every front-end gearing set.
[0015]
The gearing set RS 1 has a sun gear 11, an epicyclic gear 12, and a ring wheel 13. The gearing set RS 2 has a sun gear 21, an epicyclic gear 22, and a ring wheel 23. A planet carrier common to an epicyclic gear 12 is expressed with 15, and the planet carrier belonging to an epicyclic gear 22 is expressed with 25.
[0016]
The postposing gear NS which can be switched is a 2 carrier 4 shaft gear which consists of gearing sets RS3 and RS4 and which can be switched. The gearing set RS 3 has a sun gear 31, an epicyclic gear 32, and a ring wheel 33. The gearing set RS 4 of the postposing gear NS consists of a sun gear 41, an epicyclic gear 42, and a ring wheel 43 similarly. A planet carrier common to an epicyclic gear 32 is expressed with 35, and a planet carrier common to an epicyclic gear 42 is expressed with 45. The planet carrier 45 of the gearing set RS 4 is combined with the shaft of the gearing set RS 3. The shift elements E and D connect with this connecting shaft.
[0017]
The shift elements B and C connect with the main gearing of the gearing set RS 4. In this case, a main gearing is the sun gear of a gearing set, or a ring wheel. The shift element A connects with the main gearing of the gearing set RS 3.
[0018]

Nothing or the 2nd connecting shaft is combined with an output shaft 2 in the 2nd connecting shaft (drawing 4 A, drawing 5 A) with the main gearing of the gearing set RS 4 with which the shaft combined with the shift element A is not combined with the shift elements B and C (drawing 1 A, drawing 2 A, drawing 3 A).

[0019]

The following thing is realized about the rotational frequency of a shaft and a shift element.

1. The rotational frequency of an input shaft and the shift element E is n= 1 (as a basis).
2. The rotational frequency of the shift element D is zero or more.
3. The rotational frequency of the shift element D is below a rotational frequency of the shift element B.
4. The rotational frequency of the shift element C is smaller than the rotational frequency of the shift element B.
5. The rotational frequency of the shift element B is one or less.
6. The rotational frequency of the shift element A is within the limits of 0 thru/or 1.
7. A maximum of two shafts which lead to the postposing gearing set NS have the same rotational frequency.
8. Output Rotational Frequency Which Rotational Frequency Transmitted to Gearing Set RS 3 with Shift Elements A and D Produces in relation to Change Gear Ratio of Gearing Set RS 3 The rotational frequency transmitted to the gearing set RS 4 with the shift elements C and D is larger than the output rotational frequency produced in relation to the change gear ratio of the gearing set RS 4. Moreover, when making a connecting shaft with the main gearing of the gearing set RS 4 of the postposing gearing set NS which can switch the shaft combined with the shift element A, it is larger than the output rotational frequency produced in the change gear ratio of the gearing set RS 3.

[0020]

Drawing 1 A shows the 1st operation gestalt of this invention multistage change gear which has two connected front-end gearing sets which cannot be switched. In this case, an input shaft 1 is a front-end gearing set. It is combined with the sun gears 11 and 21 of RS1 and RS2. The ring wheel 13 of the 1st front-end gearing set RS 1 is being fixed. The planet carriers 15 and 25 of two front-end gearing sets RS1 and RS2 are combined mutually. The ring wheel 23 (engine speed n2) of the 2nd front-end gearing set RS 2 is combinable with the ring wheel 33 of the 1st postposing gearing set RS 3, and the planet carrier 45 of the 2nd postposing gearing set RS 4 with Clutch D. moreover, the planet carriers 15 and 25 (engine speed n1) -- Clutch A -- the sun gear 31 of the 1st postposing gearing set RS 3 -- moreover, it is combinable with the sun gear 41 of the 2nd postposing gearing set RS 4 with Clutch C. It can combine with a sun gear 41 with Clutch B, and an input shaft 1 can combine it with the planet carrier 45 with Clutch E. By the postposing gear NS, the planet carrier 45 of the gearing set RS 3 is combined with the ring wheel 43 of the gearing set RS 4, and the output shaft 2. Moreover, the ring wheel 33 of the gearing set RS 3 is combined with the planet carrier 45 of the gearing set RS 4.

[0021]

According to the shift diagram of drawing 1 b, an ahead stage 1 thru/or 7 and the retreat stage R can be shifted by controlling the postposing gearing set NS or its gearing sets RS3 and RS4 by rotational frequencies n, n1, and n2 by alternative connection of five shift elements A and E. In that case, it is an important advantage that what is necessary is just to cut one shift element when switching to the next stage from a certain stage, and to connect one shift element. In this way, problematic shift actuation is avoidable on the shift quality which performs coincidence connection (group shift) of two or more shift elements.

[0022]

It is that the total change gear ratio is [especially a convenient thing] large at the beginning at intervals of a good change gear ratio like the six-step automatic transmission explained as advanced technology with the operation gestalt 1 of the multistage change gear concerning this invention (9 or more). In this way, it is good without being able to transpose to the multiple disc clutch which built into the liquid clutch and/or the change gear the torque converter regularly used as for example, a start element by the application of a passenger car and giving up high start capacity moreover. The possible operation gestalt was illustrated to drawing 1 A. A convenient anchoring dimension and the advantage of reduction of cost arise to the tunnel area of a floor by small weight and compaction of an overall length by this.

[0023]

Next, another operation gestalt of this invention is explained in relation to drawing 2 A. The details of drawing 2 A already explained in relation to drawing 1 A attached the same sign.

[0024]

Unlike operation gestalt 1A, generally, operation gestalt 2A has a brake with easy control instead of a clutch as 5th shift element.

[0025]

With the operation gestalt of drawing 2 A, two sun gears 11 and 21 are combined with the input shaft 1. It can combine with a sun gear 31 with Clutch A, and an input shaft 1 can combine it with the planet carrier 45 with Clutch E. The planet carrier 15 (engine speed n1) is combinable with a sun gear 41 with Clutch B. It was combined with the planet carrier 25 and the ring wheel 13 has fixed the planet carrier 25 in housing. A ring wheel 23 (engine speed n2) is combinable with a sun gear 41 with Clutch C. The planet carrier 45 is combinable with housing with Brake D. The ring wheel 33 is combined with the planet carrier 45. The ring wheel 43 is combined with the planet carrier 35 and the output shaft 2.

[0026]

Based on the conclusion condition of five shift elements A and E which showed the change gear of drawing 2 A in drawing 2 B, seven ahead stages and one retreat stage are shifted.

[0027]

With especially the operation gestalt 2 of the multistage change gear concerning this invention, the exaggerated drive property of the stage of two high orders is advantageous about reduction of fuel consumption and the operation noise. Moreover, it is convenient that the brake D replaced with a clutch can be easily designed on structure about the pressure-oil supply for actuation.

[0028]

Drawing 3 A shows another operation gestalt of this invention multistage change gear which has two connected front-end gearing sets which cannot be switched. In this case, the front-end gearing set VS and the postposing gearing set NS are constituted as a rabbi NYO form gear. an input shaft -- one -- a gearing -- a set -- RS -- one -- a sun gear -- 11 -- joining together -- having -- **** -- a clutch -- E -- a gearing -- a set -- RS -- two -- the inside -- and -- an outside -- an epicyclic gear -- 32 -- ' -- 32 -- " -- a planet -- a carrier -- 35 -- ' -- 35 -- " -- and -- a gearing -- a set -- RS -- four -- a planet -- a carrier -- 45 -- being combinable . Moreover, an input shaft 1 is combinable with the sun gear 31 of the gearing set RS 3 with Clutch A. The planet carrier 15, 25', and 25" (engine speed n1) of the gearing sets RS1 and RS2 which were combined mutually are combinable with the sun gear 41 of the gearing set RS 4 with Clutch B. Outside epicyclic gear 22" of the epicyclic gear 12 of the gearing set RS 1 and the gearing set RS 2 is connected mutually. The sun gear 21 (engine speed n2) of the gearing set RS 2 is combinable with the sun gear 41 of the gearing set RS 4 with Clutch C. The ring wheel 13 of the gearing set RS 1 is being fixed. Planet carrier 35', 35", and 45 are fixable from a brake D2. Outside epicyclic gear 32" of the epicyclic gear 42 of the gearing set RS 4 and the gearing set RS 3 is connected mutually. The output shaft 2 has fixed to the combined ring wheels 33 and 43.

[0029]

According to the array of drawing 3 A, seven ahead stages and one retreat stage are shifted to drawing 3 B by the shift diagram shown in the table.

[0030]

With especially the operation gestalt 3 of the multistage change gear concerning this invention, the cheap design of 4 sets of epicyclic gear sets only whose two ring wheels are is advantageous. Moreover, it can use advantageous because of reduction of fuel economy and noise emission of the exaggerated drive property of the stage of two high orders.

[0031]

Drawing 4 A shows another operation gestalt of this invention multistage change gear which has two connected front-end gears which cannot be switched. In this case, the auxiliary rotational frequencies n1 and n2 are generated by the front-end gearing sets RS1 and RS2, and the planet carriers 15 and 25 of the epicyclic gears 12 and 22 of these gearing sets are mutually combined with them. It is combined with the ring wheels 13 and 23 of the gearing sets RS1 and RS2, and can combine with the ring wheel 33 of the 3rd gearing set RS 3 with Clutch E, and an input shaft 1 can be combined with the ring wheel 43 of the 4th gearing set RS 4 with Clutch B. The sun gear 11 of the 1st gearing set RS 1 is being fixed to housing. The sun gear 21 (engine speed n2) of the 2nd gearing set RS 2 can be combined with the planet carrier 45 of the gearing set RS 4 with Clutch D, and the planet carrier 45 is combined with the ring wheel 33 of the gearing set RS 3. The planet carriers 15 and 25 (engine speed n1) of the epicyclic gears 12 and 22 of the gearing sets RS1 and RS2 are combinable with the ring wheel 43 of the gearing set RS 4 with Clutch C. The sun gears 31 and 41 of the gearing sets RS3 and RS4 can be together locked by Brake A. The planet carrier 35 of the gearing set RS 3 is combined with the output shaft 2.

[0032]
Seven ahead stages and one retreat stage which were shown in drawing 4 B in the table are obtained in the array of drawing 4 A by conclusion of five shift elements A and E.
[0033]
The operation gestalt 4 of the multistage change gear concerning this invention has an advantage special especially for an off-road vehicle. In this case, based on the quiescence change gear ratio of the gearing set mentioned to especially drawing 4 B, crawling is obtained with a high change gear ratio (i_1st speed > 8), and a change gear ratio advantageous to coincidence in the high-speed travel-speed range is obtained. Moreover, while using gap **********, manufacture is cheap by abolishing the 4th ring wheel.
[0034]
The ring wheel 13 is being fixed with the operation gestalt of drawing 5 A of this invention multistage change gear which has the two front-end gearings set in which the connected change is impossible. It is combined with the planet carrier 25 and the planet carrier 15 (engine speed n1) can be combined with a ring wheel 43 with Clutch B. A ring wheel 23 (engine speed n2) is combinable with the ring wheel 33 combined with the planet carrier 45 and this with Clutch D. It is combined with sun gears 11 and 21, and can combine with sun gears 41 and 31 with Clutch A, and an input shaft 1 can be combined with the planet carrier 45 and a ring wheel 33 with Clutch E. If Brake C is concluded and Clutch B is cut, a ring wheel 43 can be adjusted to a rotational frequency 0. The planet carrier 35 is combined with the output shaft 2.
[0035]
The detailed conclusion condition of five shift elements A and E is clear about each ahead stage 1 thru/or 7 and the retreat stage R at drawing 5 b.
[0036]
The operation gestalt 5 of the multistage change gear concerning this invention has an advantage special especially for an off-road vehicle like the operation gestalt 4. In this case, it is because it can shift to extreme crawling with a very high change gear ratio (i_1st speed = 10) based on the quiescence change gear ratio of the gearing set mentioned to especially drawing 5 B. Since change-gear-ratio spacing of the 1st speed (crawling) and the 2nd speed is large, it is desirable to constitute this crawling as a special manual shift stage by the operator. The total, as a whole very large change gear ratio 15 is obtained by the usual operation. The exaggerated drive property of the stage of two high orders is effective in decreasing fuel consumption and the operation noise.
[0037]
The operation gestalt of drawing 6 A has two connected front-end gearing sets which cannot be switched, and shows this invention multistage change gear which can shift ten steps of advance, and one step of retreat with six shift elements. The auxiliary clutch F is formed in the shaft equipped with the clutches B and C of the postposing gear which can be switched. nC<nF<nB is realized.
[0038]
in that case -- an input shaft -- one (rotational frequency n) -- a ring wheel -- 13 -- and -- a ring wheel -- 23 -- joining together -- having -- **** -- a shift -- an element -- E -- a gearing -- a set -- RS -- four -- a list -- a gearing -- a set -- RS -- three -- an outside -- an epicyclic gear -- 32 -- " -- and -- the inside -- an epicyclic gear -- 32 -- ' -- mutual -- connecting -- having had -- a planet -- a carrier -- 45 -- 35 -- " -- and -- 35 -- ' -- being combinable . It is combined with the planet carrier 15 (engine speed n1), and the planet carrier 25 can be combined with a sun gear 41 with Clutch B. A sun gear 41 can be locked by actuation of Brake C, or can be combined with housing. The planet carriers 15 and 25 (engine speed n1) are combinable with a sun gear 31 with Clutch A. a sun gear 21 (engine speed n2) -- Clutch D -- planet carrier 35of inside epicyclic gear 32' of gearing set RS 3' -- moreover, it is combinable with the sun gear 41 of the gearing set RS 4 with Clutch F. The ring wheels 33 and 43 of each other [and] are combined with the output shaft 2.
[0039]
In relation to the quiescence change gear ratio mentioned to drawing 6 B by conclusion of the shift elements A and F, ten steps of advance and one step of retreat which were shown in the table are shifted to drawing 6 b with this multistage change gear. As compared with the old operation gestalt 1 of this invention multistage change gear of seven steps of advance thru/or 5, three another ahead stages are obtained with an auxiliary shift element. There is an advantage which can design change-gear-ratio spacing narrowly, therefore it is convenient on for example, a diesel-power-plant vehicle.
[0040]
Next, in relation to drawing 7 A and 7B, it has two connected front-end gearing sets which cannot be switched, and this invention multistage change gear which can shift nine steps of advance and two steps of

retreat with six shift elements A and F is explained.
[0041]
It is combined with the ring wheel 23 of the front-end gearing set RS 2 combined with the ring wheel 13 of the front-end gearing set RS 1, and this, and it can combine with the planet carrier 45 with Clutch E, and an input shaft 1 can be combined with a sun gear 41 with Clutch B. It is combined with the planet carrier 15 (engine speed n1), and the planet carrier 25 of an epicyclic gear 22 can be combined with a sun gear 31 with Clutch A. Moreover, the planet carrier 25 and the planet carrier 15 are combinable with a sun gear 41 with Clutch F. It can combine with a sun gear 41 with Clutch C, and a sun gear 21 (engine speed n2) can be combined with the planet carrier 45 with Clutch D. The planet carrier 45 is combined with the ring wheel 33. The ring wheel 43 is combined with the planet carrier 35 and the output shaft 2.
[0042]
With the above-mentioned operation gestalt 7 of the multistage change gear concerning this invention, as shown to drawing 7 B in a table, in relation to the quiescence change gear ratio of the gearing set mentioned to drawing 7 B, two retreat stages are shifted to nine ahead stages and a convenient thing by alternative conclusion of the shift elements A and F at intervals of a narrow change gear ratio. The special retreat stage which made the start change gear ratio low as compared with the "usual" retreat stage is incorporable into the winter operation program of an automatic transmission.
[0043]
The operation gestalt of drawing 8 A has two connected front-end gearing sets which cannot be switched, and shows this invention multistage change gear which prepared a total of six shift elements A and F which shift nine steps of advance, and two steps of retreat for actuation of a change gear.
[0044]
As compared with five clutches and the multistage change gear of drawing 6 A which equipped one brake, the multistage change gear of drawing 8 A has four clutches and two brakes, and, for this reason, the number of ahead stages is decreasing only by one step as compared with drawing 6 A.
[0045]
Although the gearing set RS 2 is a minus gear, the gearing set RS 1 is a plus gear. an input shaft 1 -- a sun gear 21 and the planet carrier 15 of outside epicyclic gear 12of gearing set RS 1" -- " -- joining together -- having -- **** -- Clutch A -- a sun gear 31 -- moreover, it is combinable with the planet carrier 45 with Clutch E. On the other hand, the planet carrier 25 is combined with housing of a change gear with the sun gear 11 of the gearing set RS 1. a gearing -- a set -- RS -- one -- the inside -- an epicyclic gear -- 12 -- ' -- a planet -- a carrier -- 15 -- ' -- an outside -- an epicyclic gear -- 12 -- " -- a planet -- a carrier -- 15 -- " -- joining together -- having -- **** . The ring wheel 13 of the gearing set RS 1 (engine speed n1) is combinable with a sun gear 41 with Clutch B. A ring wheel 23 (engine speed n2) is combinable with a sun gear 41 with Clutch C. A sun gear 41 is combinable with housing with actuation of Brake F. The planet carrier 45 is combinable with housing with actuation of Brake D. Moreover, the planet carrier 45 is combined with the ring wheel 33. The ring wheel 43 is combined with the planet carrier 35 and the output shaft 2.
[0046]
A table shows the shift diagram of six shift elements A and F for the shift of nine ahead stages of this multistage change gear of drawing 8 A, and retreat stages to drawing 8 B.
[0047]
It is convenient that two shift elements consist of operation gestalten 8 of this invention multistage change gear as a brake, and by this, comparing with a clutch, since piping of the pressure-oil path in change gear housing is easy, the advantage on structure arises. Change-gear-ratio spacing is almost regular, and especially the phase array that was able to take very harmony of nine ahead stages to which it falls gently to a high order stage side is also advantageous.
[0048]
Next, in relation to drawing 9 A and 9B, another this invention multistage change gear which can shift eight steps of advance and two steps of retreat by total of six shift elements A and F is explained.
[0049]
The description of this change gear is that there is only a front-end gearing set which cannot switch one piece instead of the front-end gearing set of two each explained until now. an input shaft 1 (rotational frequency n) is combined with the sun gear 11 of the gearing set RS 1 (plus gear) -- having -- **** -- Clutch E -- the planet carrier 45 -- moreover, it is combinable with a sun gear 41 with Clutch B. a gearing -- a set -- RS -- one -- the inside -- an epicyclic gear -- 12 -- ' -- a planet -- a carrier -- 15 -- ' -- a gearing -- a set -- RS -

- one -- an outside -- an epicyclic gear -- 12 -- " -- a planet -- a carrier -- 15 -- " -- mutual -- joining together -- having -- housing -- fixing -- having -- **** . Furthermore, planet carrier 15' and planet carrier 15" are combinable with a sun gear 41 with Clutch C. It can combine with a sun gear 41 with Clutch F, and a ring wheel 13 (engine speed n1) can be combined with a sun gear 31 with Clutch A. The ring wheel 43 is combined with the ring wheel 33 and the output shaft 2. It is combined mutually and the planet carrier 45 (epicyclic gear 42), 35' (inside epicyclic gear 32'), and 35" (outside epicyclic gear 32") can be locked by Brake D. In addition, epicyclic gear 32" and 42 are connected mutually.

[0050]

The shift diagram of this multistage change gear that shifts eight steps of advance and two steps of retreat by conclusion of the shift elements A and F is shown in drawing 9 B.

[0051]

Since 3 sets of epicyclic gear sets only with a total of two ring wheels were only prepared in this this invention multistage change gear, the cheap structure where especially the location other than a number of stages is not taken is advantageous. The phase array of a gear ratio has taken harmony and can shift it to the "high-speed" retreat stage other than a "usual" retreat stage like the operation gestalt 7.

[0052]

Drawing 10 A has three the front-end gearing sets RS 1 which cannot be switched, RS2a, and RS2bs which were connected, and shows the multistage change gear which can shift a total of 13 ahead stages and one retreat stage with seven shift elements A and G. The auxiliary clutch F is formed in the shaft which has Clutches B, C, and F. nF>nG>nB is realized. An input rotational frequency is generated by the 3 carrier 5 shaft gear which cannot be switched.

[0053]

the sun gear 41 of the 2nd postposing gearing set RS 4 which the input shaft 1 (engine speed n) is combined with the sun gear 11 of the 1st front-end gearing set RS 1, and was combined with the sun gear 31 of the 1st postposing gearing set RS 3, and this with Clutch A -- moreover, it is combinable with the planet carrier 45 of the 2nd postposing gearing set RS 4 with Clutch E.

[0054]

the former -- having explained -- a change gear -- preparing -- having had -- a gearing -- a set -- RS -- two -- here -- **** -- a gearing -- a set -- RS -- two -- a -- and -- RS -- 2b -- from -- becoming -- a gearing -- a set -- RS -- two -- a -- an epicyclic gear -- 22 -- a -- a planet -- a carrier -- 25 -- a -- plus -- a gear -- ****** -- constituting -- having had -- a gearing -- a set -- RS -- 2b -- an outside -- an epicyclic gear -- 22 -- b -- " -- a planet -- a carrier -- 25 -- b -- " -- mutual -- connecting -- having -- **** . Furthermore, epicyclic gear 22a and 22b" are connected mutually. a planet -- a carrier -- 15 -- the inside -- an epicyclic gear -- 22 -- b -- ' -- a planet -- a carrier -- 25 -- b -- ' -- and -- an outside -- an epicyclic gear -- 22 -- b -- " -- a planet -- a carrier -- 25 -- b -- " -- joining together -- having -- **** . Moreover, planet carrier 25b" is combinable with a ring wheel 43 with Clutch G (rotational frequency n2a). A ring wheel 43 can be locked by Brake C. Sun-gear 21of gearing set RS2a (engine speed n1) a is combinable with a ring wheel 43 with Clutch B. Ring wheel 23b of ring wheel 23a and gearing set RS2b of gearing set RS2a is combinable with the ring wheel 33 by which it was mutually combined (engine-speed n2b), and it was combined with the ring wheel 43 with Clutch F, and it was combined with the planet carrier 45 and this with Clutch D. The planet carrier 35 is combined with the output shaft 2. Finally the ring wheel 13 of sun-gear 21b of gearing set RS2b and the gearing set RS 1 is combined with housing.

[0055]

13 steps of advance and one step of retreat which are shown in drawing 10 B by alternative conclusion of seven shift elements in a table in relation to the quiescence change gear ratio of the gearing set mentioned to drawing 10 B are shifted with this above-mentioned multistage change gear.

[0056]

In this way, the advantage of this operation gestalt of the multistage change gear concerning this invention is in a number of stages being large with very compact change gear structure only with five an epicyclic gear set and seven shift elements. By choosing the change gear ratio of a gearing set suitably, the multistage change gear of two steps of retreat can also be drawn from the operation gestalt 10. However, there is only 12 ahead stage in that case.

[0057]

In the operation gestalt of drawing 11 A of the multistage change gear concerning this invention, a total of 16 ahead stages and one retreat stage are shifted with eight shift elements. The shaft which has Clutches B, C, F, and G equips the auxiliary clutch H. nG<nH<nB is realized. An input rotational frequency is generated

by the 4 carrier 6 shaft gear which cannot be switched.
[0058]
The front-end gearing set VS has a total of four connected epicyclic gear sets which cannot be switched. a front end -- a gearing -- a set -- RS -- one -- a gearing -- a set -- RS -- one -- a -- a gearing -- a set -- RS -- one -- b -- from -- becoming -- a gearing -- a set -- RS -- one -- a -- an epicyclic gear -- 12 -- a -- a gearing -- a set -- RS -- one -- b -- an outside -- an epicyclic gear -- 12 -- b -- " -- mutual -- connecting -- having -- an outside -- an epicyclic gear -- 12 -- b -- " -- a planet -- a carrier -- 15 -- b -- " -- the inside -- an epicyclic gear -- 12 -- b -- ' -- a planet -- a carrier -- 15 -- b -- ' -- joining together -- having -- **** . The gearing set RS 2 consists of two gearings set RS2a and RS2b, and outside epicyclic gear 22b" of epicyclic gear 22a and gearing set RS2b of gearing set RS2a is connected mutually.
[0059]
an input shaft 1 (rotational frequency n) is combined with sun-gear 21of sun-gear 11b and gearing set RS2a of gearing set RS1b a -- having -- **** -- Clutch A -- a sun gear 31 -- moreover, it is combinable with a ring wheel 33 with Clutch E. Sun-gear 11of gearing set RS1a a is combined with housing. It is combined mutually (engine-speed n1a), and the ring wheels 13a and 13b of gearing set RS1a and gearing set RS1b can be combined with the sun gear 41 of the 2nd postposing gearing set RS 4 with Clutch B. A sun gear 41 can be locked by Brake C. Sun-gear 21b (engine-speed n2b) of gearing set RS2b can be combined with a ring wheel 33 with Clutch D, and can be combined with a sun gear 41 with Clutch F. The ring wheel 33 is combined with the planet carrier 45. a gearing -- a set -- RS -- 2b -- the inside -- an epicyclic gear -- 22 -- b -- ' -- and -- an outside -- an epicyclic gear -- 22 -- b -- " -- a planet -- a carrier -- 25 -- b -- ' -- and -- 25 -- b -- " -- a gearing -- a set -- RS -- two -- a -- a planet -- a carrier -- 25 -- a -- mutual -- joining together -- having -- **** (engine-speed n1b) -- Clutch H -- a sun gear 41 -- being combinable . Similarly the ring wheels 23a and 23b (engine-speed n2a) with which gearing set RS2a and RS2b were connected are combinable with a sun gear 41 with Clutch G. The ring wheel 43 is combined with the planet carrier 35 and the output shaft 2.
[0060]
16 steps of advance and one step of retreat which were shown in drawing 11 B by conclusion of eight shift elements A and H in the table in relation to the quiescence change gear ratio of the gearing set mentioned to drawing 11 B are operated with the above-mentioned change gear. In this way, the advantage of this operation gestalt 11 of this invention multistage change gear is that a number of stages is very large with the compact change gear structure of having a small number of epicyclic gear set and shift element comparatively. By choosing the change gear ratio of a gearing set suitably, the multistage change gear of two steps of retreat can also be drawn from the operation gestalt 11. However, the number of ahead stages decreases to 15 in that case.
[0061]
Next, in relation to drawing 12 A, it has eight ahead stages, and the multistage change gear which can shift this by five shift elements and only one front-end gearing sets RS 1 is explained. This is obtained by restricting the above-mentioned movement conditions "the rotational frequency of the shift element D being below a rotational frequency of the shift element B" on conditions "the rotational frequency of the shift element D being equal to the rotational frequency of the shift element B."
[0062]
The ring wheel 13 of the front-end gearing set RS 1 has fixed in housing of a multistage change gear with the shaft. It can combine with the planet carrier 45 of the 2nd postposing gearing set RS 4 which is combined with the sun gear 11 of the front-end gearing set RS 1, and was combined with the ring wheel 33 of the 1st postposing gearing set RS 3, and this with Clutch E, and an input shaft 1 (engine speed n) can be combined with the sun gear 31 of the gearing set RS 3 with Clutch A. It can combine with the sun gear 41 of the gearing set RS 4 with Clutch B, and the planet carrier 15 (engine speed n1) of the gearing set RS 1 can combine it with the ring wheel 33 of the gearing set RS 3 with Clutch D. The sun gear 41 of the gearing set RS 4 is fixable with Brake C. The planet carrier 35 of the gearing set RS 3 combined with the ring wheel 43 of the gearing set RS 4 and this is combined with the output shaft 2.
[0063]
A total of eight ahead stages shown in drawing 12 B are shifted by alternative conclusion of the shift elements A and E with the above-mentioned change gear.
[0064]
Next, in relation to drawing 13 A, it has eight ahead stages and another operation gestalt of this invention multistage change gear which can shift this with five shift elements is explained.
[0065]

Also with this change gear, the same single front-end gearing set RS 1 is formed, and a rotational frequency required for control of the gearing sets RS [RS3 and] 4 of postposing is produced. The front-end gearing set RS 1 has inside epicyclic gear 12' and outside epicyclic gear 12" other than a sun gear 11 and a ring wheel 13, and the planet carrier 15' and 15" are combined mutually.

[0066]

an input shaft -- one (engine speed n) -- a front end -- a gearing -- a set -- RS -- one -- a sun gear -- 11 -- joining together -- having -- **** -- a clutch -- E -- the -- one -- postposing -- a gearing -- a set -- RS -- three -- an outside -- an epicyclic gear -- 32 -- " -- a planet -- a carrier -- 35 -- " -- being combinable -- moreover, the clutch A -- the sun gear 31 of the gearing set RS 3 -- being combinable . Planet carrier 15' and 15" of the gearing set RS 1 are combined with housing of a multistage change gear. The sun gear 41 of the gearing set RS 4 can be locked by Brake C. It can combine with a sun gear 41 with Clutch B, and the ring wheel 13 (engine speed n1) of the gearing set RS 1 can be combined with planet carrier 35of inside epicyclic gear 32' of gearing set RS 3' with Clutch D. a planet -- a carrier -- 35 -- ' -- a gearing -- a set -- RS -- three -- an outside -- an epicyclic gear -- 32 -- " -- a planet -- a carrier -- 35 -- " -- and -- a gearing -- a set -- RS -- four -- a planet -- a carrier -- 45 -- joining together -- having -- **** . In addition, epicyclic gear 32" and 42 are connected mutually. The ring wheels 33 and 43 of the gearing sets RS3 and RS4 are combined with the output shaft 2.

[0067]

A total of eight ahead stages shown in the table are shifted to drawing 14 B by alternative conclusion of the shift elements A and E with this above-mentioned change gear.

[0068]

Next, in relation to drawing 14 A, another operation gestalt of this invention multistage change gear which has eight ahead stages is explained. These ahead stages can be shifted with five shift elements, and only the only one front-end gearing set is prepared too.

[0069]

The sun gear 11 of the front-end gearing set RS 1 has fixed in housing of a multistage change gear. An input shaft 1 (engine speed n) is combinable with the ring wheel 43 of the gearing set RS 4 which could combine with the sun gear 31 of the 1st postposing gearing set RS 3 which is combined with the ring wheel 13 of the gearing set RS 1, and was combined with the planet carrier 45 of the 2nd postposing gearing set RS 4, and this with Clutch E, and was combined with the ring wheel 33 of the gearing set RS 3, and this with Clutch A. It can combine with a sun gear 41 with Clutch B, and the planet carrier 15 (engine speed n1) of the gearing set RS 1 can combine it with the planet carrier 45 of the gearing set RS 4 with Clutch D. The sun gear 41 of the gearing set RS 4 is fixable with Brake C. The planet carrier 35 of the gearing set RS 3 is combined with the output shaft 2.

[0070]

A total of eight ahead stages shown in drawing 14 B are shifted by alternative conclusion of the shift elements A and E with the above-mentioned change gear.

[0071]

A total of eight ahead stages are obtained with a sufficient condition according to the operation gestalten 12, 13, and 14 of this invention multistage change gear in which only three pieces and five shift elements are as for an epicyclic gear set. Especially change gear structure is very compact, and since the retreat stage was abolished, especially these operation gestalten 12, 13, and 14 are suitable for motorcycles as a rear changer with a built-in hub of a bicycle again. Since the phase configuration of the operation gestalt 12 has the exaggerated drive property of a high order moderate to two steps, it is convenient because of application by motorcycle. The combination of change-gear-ratio spacing which becomes large to a change-gear-ratio spacing [with the narrow intermediate stage of the operation gestalten 13 and 14] and low-speed side is convenient especially although it is used by the bicycle.

[0072]

Next, in relation to drawing 15 A, it has two connected front-end gearing sets which cannot be switched, and another this invention multistage change gear which can shift a total of 11 ahead stages by alternative conclusion of six shift elements A and F by this is explained.

[0073]

The 2nd front-end gearing set RS 2 is constituted as a plus gear, the 1st front-end gearing set RS 1 is constituted as a minus gear, and outside epicyclic gear 22" of the gearing set RS 2 is joined with the epicyclic gear 12 of the gearing set RS 1. an input shaft 1 (engine speed n) is combined with the sun gear 21 of the gearing set RS 2 -- having -- **** -- Clutch B -- a sun gear 41 -- moreover, it can combine with the

planet carrier 45 of the 2nd postposing gearing set RS 4 with Clutch E, and the planet carrier 45 is combined with the ring wheel 33 of the 1st postposing gearing set RS 3. It can combine with the sun gear 31 of the gearing set RS 3 with Clutch A, and the planet carrier 15 (engine speed n1) common to the epicyclic gear 12 of outside epicyclic gear 22" of the gearing set RS 2 and the gearing set RS 1 can be combined with the sun gear 41 of the gearing set RS 4 with Clutch F. further -- a planet -- a carrier -- 15 -- a gearing -- a set -- RS -- two -- an outside -- an epicyclic gear -- 22 -- " -- and -- the inside -- an epicyclic gear -- 22 -- ' -- a planet -- a carrier -- 25 -- " -- and -- 25 -- ' -- joining together -- having -- **** . It can combine with the planet carrier 45 with Clutch D, and the ring wheels 13 and 23 (engine speed n2) with which the gearing sets RS1 and RS2 were connected can combine them with the sun gear 41 of the gearing set RS 4 with Clutch C. The planet carrier 35 of the gearing set RS 3 is combined with the ring wheel 43 of the gearing set RS 4, and the output shaft 2.

[0074]

With this multistage change gear, as shown in drawing 15 B, the ahead stage of 11 is shifted by alternative conclusion of the shift elements A and F.

[0075]

Finally in relation to drawing 16 A, another this invention multistage change gear which can shift the ahead stage of 17 with eight shift elements is explained. Total a set of four front-end gearings in which the connected change is impossible is prepared in this case like operation gestalt 11A. And the front-end gearing set RS 1 consists of gearing set RS1a and gearing set RS1b, and the front-end gearing set RS 2 consists of gearing set RS2a and gearing set RS2b.

[0076]

an input shaft -- one -- the -- one -- a front end -- a gearing -- a set -- RS -- one -- a (plus gear) -- a sun gear -- 11 -- a -- joining together -- having -- **** -- a clutch -- A -- the -- one -- postposing -- a gearing -- a set -- RS -- three -- a sun gear -- 31 -- being combinable -- moreover -- a clutch -- E -- a gearing -- a set -- RS -- three (plus gear) -- the inside -- an epicyclic gear -- 32 -- ' -- and -- an outside -- an epicyclic gear -- 32 -- " -- a planet -- a carrier -- 35 -- ' -- and -- 35 -- " -- being combinable . a gearing -- a set -- RS -- one -- a -- the inside -- an epicyclic gear -- 12 -- a -- ' -- a planet -- a carrier -- 15 -- ' -- a gearing -- a set -- RS -- one -- a -- an outside -- an epicyclic gear -- 12 -- a -- " -- a planet -- a carrier -- 15 -- " -- mutual -- joining together -- having -- **** . Gearing set RS1b is constituted as a minus gear. In this case, sun-gear 11of 2nd front-end gearing set RS1b b is equivalent to sun-gear 21of 3rd front-end gearing set RS2a a. Moreover, ring wheel 13of 2nd gearing set RS1b b is equivalent to ring wheel 23b of 4th front-end gearing set RS2b. Outside epicyclic gear 12a" of gearing set RS1a, epicyclic gear 1of gearing set RS1b b and epicyclic gear 22of gearing set RS2a a, and epicyclic gear 22b of gearing set RS2b are mutually connected as gap **********. Planet carrier 15a" is together assigned to these epicyclic gears. planet carrier 15a" (engine-speed n1b) -- Clutch G -- the sun gear 41 of the 2nd postposing gearing set RS 4 (minus gear) -- moreover, it is combinable with planet carrier 35of inside epicyclic gear 32' of 1st postposing gearing set RS 3' with Clutch D. The gearing set RS 3 is constituted as a plus gear. Outside epicyclic gear 32" of the gearing set RS 3 is connected with the epicyclic gear 42 of the gearing set RS 4. the inside -- an epicyclic gear -- 32 -- ' -- a planet -- a carrier -- 35 -- ' -- a gearing -- a set -- RS -- three -- an outside -- an epicyclic gear -- 32 -- " -- a planet -- a carrier -- 35 -- " -- joining together -- having -- **** . Sun-gear 11of gearing set RS1b b is combined with housing. Sun-gear 21b of gearing set RS2b (engine-speed n2b) can be combined with a sun gear 41 with Clutch F, and, similarly a sun gear 41 can be combined with housing by Brake C. It is combined mutually and the ring wheels 13a and 13b of gearing set RS1a and gearing set RS1b can be combined with a sun gear 41 with Clutch B (rotational frequency n1a). planet carrier 35" -- the planet (it -- planet carrier 35') carrier 45 -- and it is combined mutually. Ring wheel 23of gearing set RS2a (engine-speed n2a) a is combinable with the sun gear 41 of the gearing set RS 4 with Clutch H. Finally ring wheels 33 and 43 are combined with the output shaft 2.

[0077] In relation to the quiescence change gear ratio of the gearing set mentioned to drawing 16 B with this multistage change gear, as shown in drawing 16 B, a total of 17 ahead stages are shifted by alternative conclusion of eight shift elements A and H.

[0078]

Especially the above-mentioned operation gestalten 15 and 16 of this invention multistage change gear as well as the operation gestalten 12, 13, and 14 are suitably suitable for motorcycles as a change gear for bicycles with a built-in hub with the big number of stages.

[Brief Description of the Drawings]

[Drawing 1]

It is drawing of the 1st operation gestalt of the multistage change gear of seven steps of advance, and one step of retreat.
[Drawing 2]
It is drawing of the 2nd operation gestalt of the multistage change gear of seven steps of advance, and one step of retreat.
[Drawing 3]
It is drawing of the 3rd operation gestalt of the multistage change gear of seven steps of advance, and one step of retreat.
[Drawing 4]
It is drawing of the 4th operation gestalt of the multistage change gear of seven steps of advance, and one step of retreat.
[Drawing 5]
It is drawing of the 5th operation gestalt of the multistage change gear of seven steps of advance, and one step of retreat.
[Drawing 6]
It is drawing of the 6th operation gestalt of this invention multistage change gear of ten steps of advance, and one step of retreat.
[Drawing 7]
It is drawing of the 7th operation gestalt of this invention multistage change gear of nine steps of advance, and two steps of retreat.
[Drawing 8]
It is drawing of the 8th operation gestalt of this invention multistage change gear of nine steps of advance, and one step of retreat.
[Drawing 9]
It is drawing of the 9th operation gestalt of this invention multistage change gear of eight steps of advance, and two steps of retreat.
[Drawing 10]
It is drawing of the 10th operation gestalt of this invention multistage change gear of 13 steps of advance, and one step of retreat.
[Drawing 11]
It is drawing of the 11th operation gestalt of this invention multistage change gear of 16 steps of advance, and one step of retreat.
[Drawing 12]
It is drawing of the 12th operation gestalt of this invention multistage change gear without eight steps of advance and retreat stages.
[Drawing 13]
It is drawing of the 13th operation gestalt of this invention multistage change gear without eight steps of advance and retreat stages.
[Drawing 14]
It is drawing of the 143rd operation gestalt of this invention multistage change gear without eight steps of advance and retreat stages.
[Drawing 15]
It is drawing of the 15th operation gestalt of this invention multistage change gear without 11 steps of advance and retreat stages.
[Drawing 16]
It is drawing of the 16th operation gestalt of this invention multistage change gear without 17 steps of advance and retreat stages.
[Description of Notations]
VS Front-end epicyclic gear set RS 1 The 1st front-end epicyclic gear set, 1st epicyclic gear set RS1a 1st front-end epicyclic gear set RS1b 2nd front-end epicyclic gear set RS 2 The 2nd front-end epicyclic gear set, 2nd epicyclic gear set RS2a 3rd front-end epicyclic gear set RS2b 4th front-end epicyclic gear set NS Postposing epicyclic gear set RS 3 The 1st postposing epicyclic gear set, 3rd epicyclic gear set RS 4 The 2nd postposing epicyclic gear set, 4th epicyclic gear set A-H The 1st thru/or 8th shift element (a clutch or brake)
n Input rotational frequency n1 of an input shaft Output rotational frequency n1a of the epicyclic gear set RS 1 Output rotational frequency n1b of epicyclic gear set RS1a Output rotational frequency n2 of epicyclic

gear set RS1b Output rotational frequency n2a of the epicyclic gear set RS 2 Output rotational frequency n2b of epicyclic gear set RS2a The output rotational frequency 1 of epicyclic gear set RS2b input shaft 2 Output shaft 11 Sun-gear 11a of the gearing set RS 1 Sun-gear 11b of gearing set RS1a Sun gear 12 of gearing set RS1b Epicyclic gear 12' of the gearing set RS 1 Inside epicyclic gear 12" of the gearing set RS 1 Outside epicyclic gear 12a of gearing set RS 1 Epicyclic gear 12a' of gearing set RS1a Inside epicyclic gear 12a" of gearing set RS1a Outside epicyclic gear 12b of gearing set RS1a Epicyclic gear 12b' of gearing set RS1b Inside epicyclic gear 12b" of gearing set RS1b The outside epicyclic gear 13 of gearing set RS1b Ring wheel 13a of gearing set RS 1 Ring wheel 13b of gearing set RS1a Ring wheel 15 of gearing set RS1b Planet carrier 15' of the gearing set RS 1 Planet carrier 15" of the inside epicyclic gear of the gearing set RS 1 Planet carrier 15a of the outside epicyclic gear of gearing set RS 1 Planet carrier 15a' of gearing set RS1a Planet carrier 15a" of the inside epicyclic gear of gearing set RS1a Planet carrier 15b of the outside epicyclic gear of gearing set RS1a Planet carrier 15b' of gearing set RS1b Planet carrier 15b" of the inside epicyclic gear of gearing set RS1b Planet carrier 21 of the outside epicyclic gear of gearing set RS1b Sun-gear 21a of the gearing set RS 2 Sun-gear 21b of gearing set RS2a The sun gear 22 of gearing set RS2b epicyclic gear 22' of gearing set RS 2 the inside epicyclic gear 22 of the gearing set RS 2 -- "inside epicyclic gear 22b of epicyclic gear 22b' gearing set RS2b of epicyclic gear 22b gearing set RS2b of outside epicyclic gear 22a epicyclic gear set RS2a of gearing set RS 2" -- The outside epicyclic gear 23 of gearing set RS2b Ring wheel 23a of gearing set RS 2 Ring wheel 23b of gearing set RS2a Ring wheel 25 of gearing set RS2b Planet carrier 25' of the gearing set RS 2 Planet carrier 25" of the inside epicyclic gear of the gearing set RS 2 Planet carrier 25a of the outside epicyclic gear of gearing set RS 2 Planet carrier 25b of gearing set RS2a Planet carrier 25b' of gearing set RS2b Planet carrier 25b" of the inside epicyclic gear of gearing set RS2b Planet carrier 31 of the outside epicyclic gear of gearing set RS2b Sun gear 32 of the epicyclic gear set RS 3 Epicyclic gear 32' of the gearing set RS 3 Inside epicyclic gear 32" of the gearing set RS 3 The outside epicyclic gear 33 of the gearing set RS 3 Ring wheel 35 of gearing set RS 3 Planet carrier 35' of the gearing set RS 3 Planet carrier 35" of the inside epicyclic gear of the gearing set RS 3 Planet carrier 41 of the outside epicyclic gear of the gearing set RS 3 The sun gear 42 of the gearing set RS 4 Epicyclic gear 43 of gearing set RS 4 Ring wheel 45 of the gearing set RS 4 Planet carrier of the gearing set RS 4

[Translation done.]

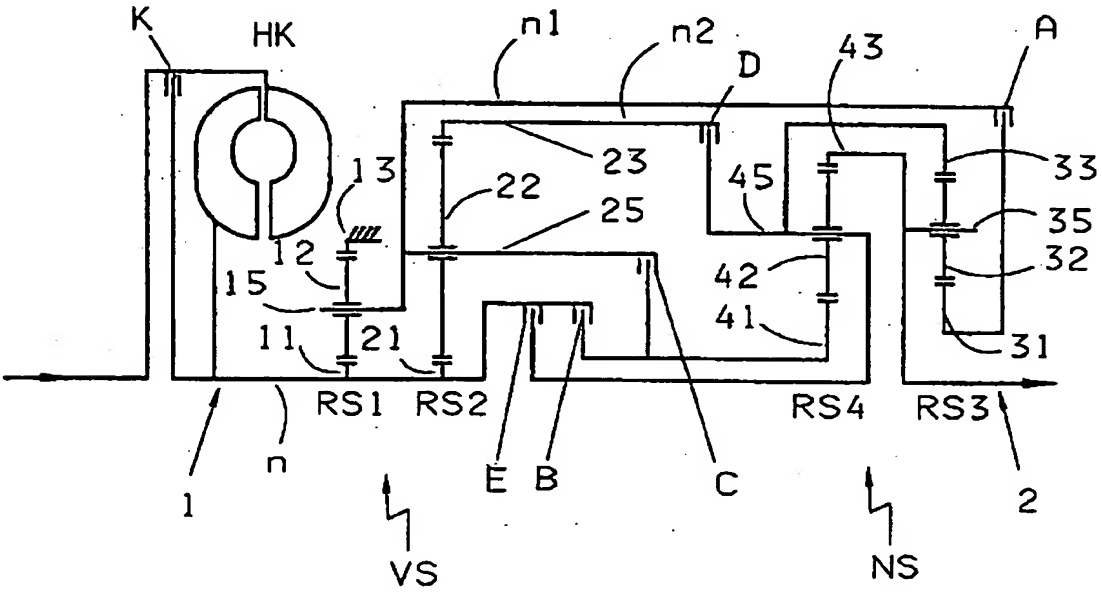
* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]

(A)



(B)

締結されたシフト要素

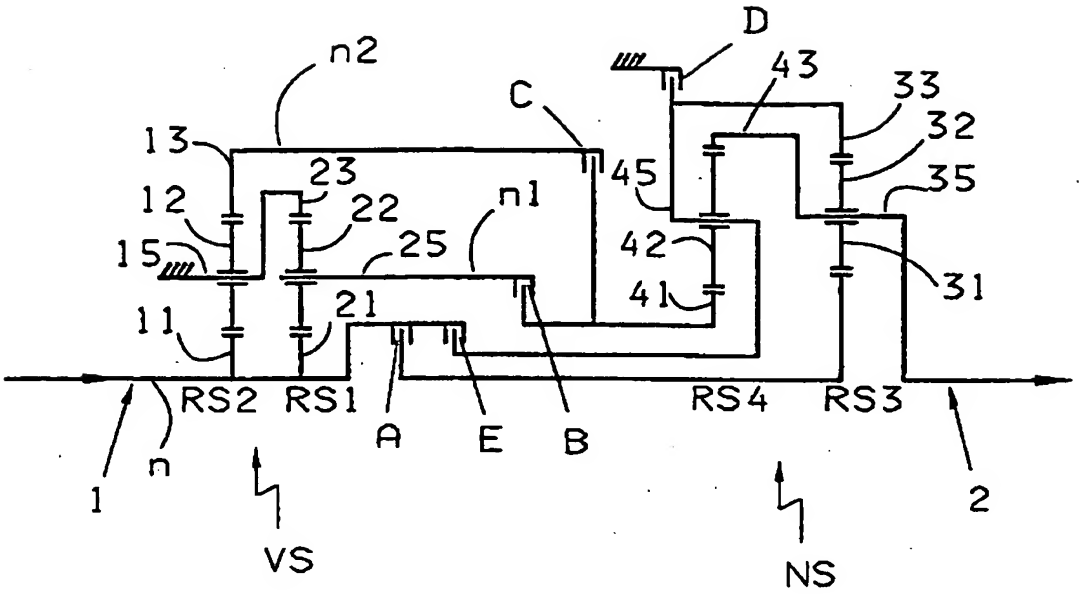
変速段	シフト要素					変速比	変速比間隔 (総変速比9.15)
	A	B	C	D	E		
1			o	o		7.23	1.86
2	o			o		3.88	1.41
3	o		o			2.75	1.65
4	o	o				1.67	1.31
5	o				o	1.27	1.27
6		o			o	1	1.26
7			o		o	0.79	
R		o		o		-7.88	

静止変速比

I0(RS3) = -2.0
I0(RS4) = -2.4
I0(RS1) = -1.75
I0(RS2) = -4.0

[Drawing 2]

(A)



(B)

締結されたシフト要素

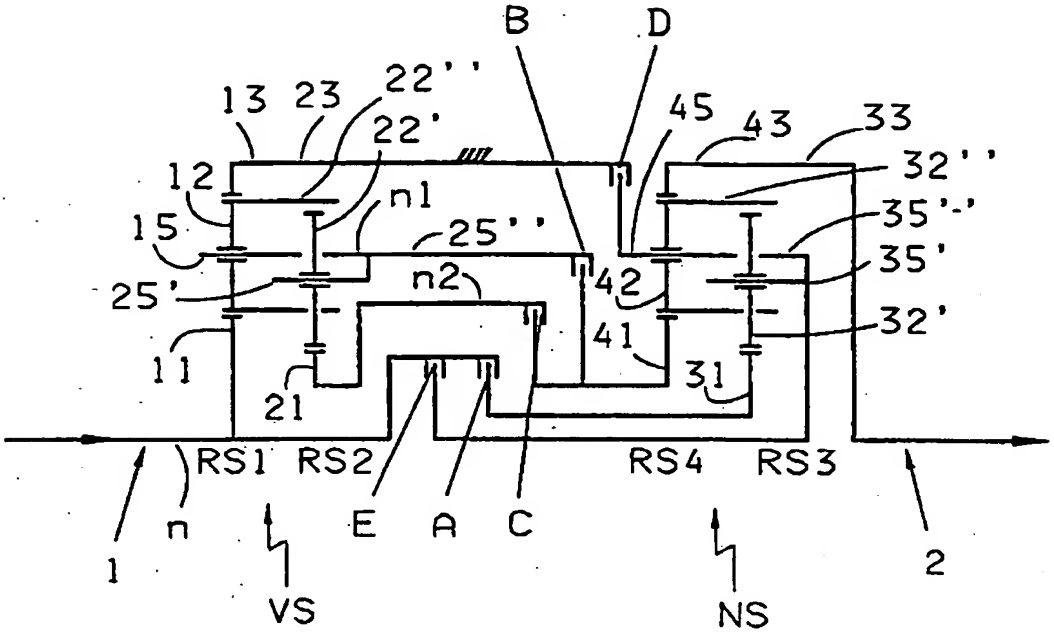
変速段	シフト要素					変速比	変速比間隔 (総変速比9.0)
	A	B	C	D	E		
1			○	○		6.00	1.86
2	○			○		3.25	1.41
3	○		○			2.17	1.65
4	○	○				1.32	1.31
5	○				○	1	1.27
6		○			○	0.82	1.26
7			○		○	0.67	
R		○		○		-9.00	

静止変速比

I0(RS3) = -2.25
I0(RS4) = -3.0
I0(RS1) = -2.0
I0(RS2) = -2.0

[Drawing 3]

(A)



(B)

締結されたシフト要素

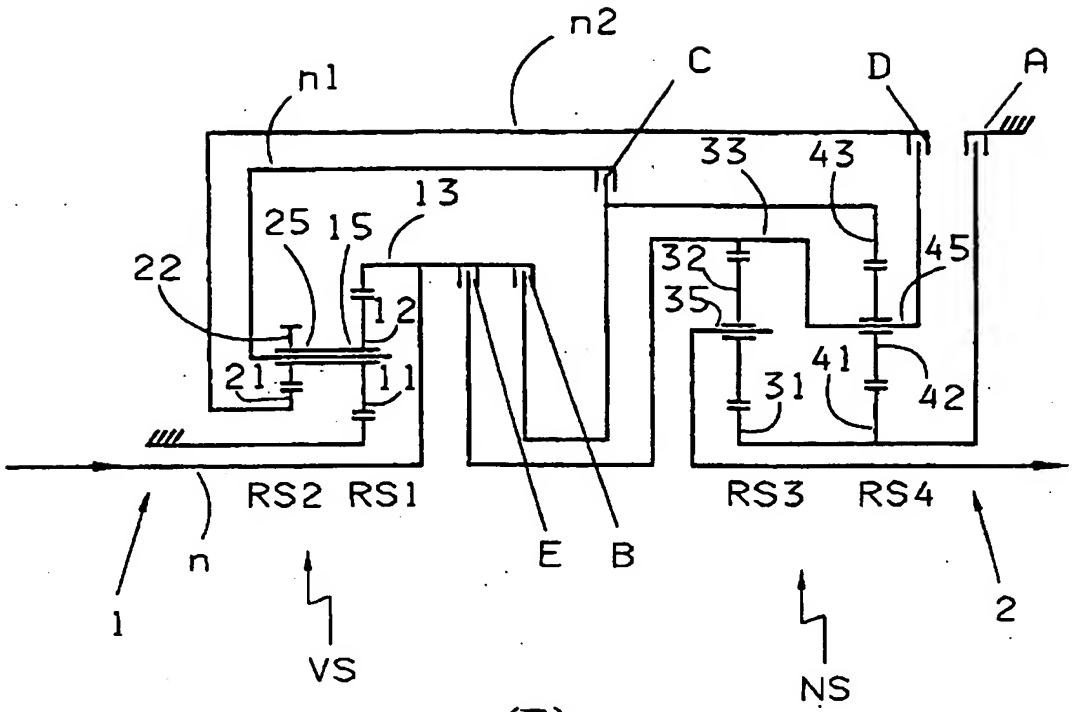
変速段	シフト要素					変速比	変速比間隔 (総変速比9.0)
	A	B	C	D	E		
1			○	○		6.00	1.86
2	○			○		3.25	1.50
3	○		○			2.17	1.65
4	○	○				1.32	1.32
5	○				○	1	1.22
6		○			○	0.82	1.22
7			○		○	0.67	
R		○		○		-9.00	

静止変速比

IO(RS3) = +3.25
IO(RS4) = -3.0
IO(RS1) = -2.0
IO(RS2) = +2.5

[Drawing 4]

(A)



(B)

締結されたシフト要素

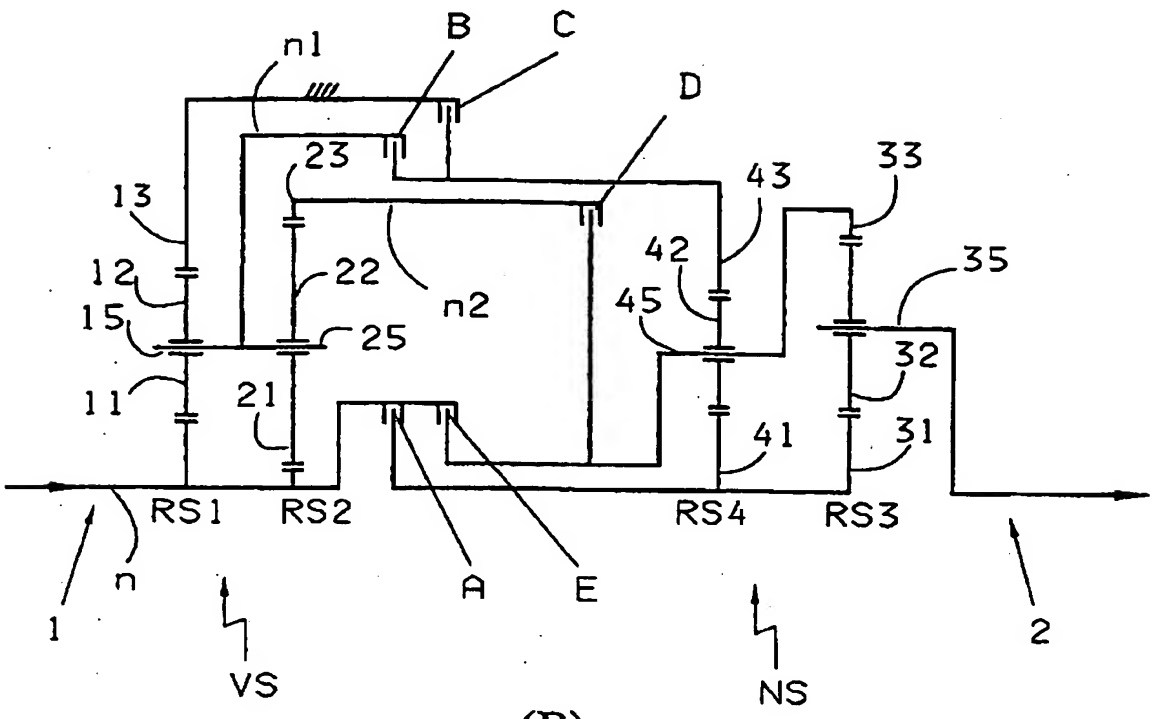
変速段	シフト要素					変速比	変速比間隔 (総変速比10.2)
	A	B	C	D	E		
1			○	○		8.3	2.08
2	○			○		4.0	1.43
3	○		○			2.8	1.53
4	○	○				1.83	1.38
5	○				○	1.33	1.33
6		○			○	1	1.23
7			○		○	0.81	
R		○		○		-8.6	

静止変速比

I0(RS3) = -3.0
I0(RS4) = -2.7
I0(RS1) = -1.86
12/22 = +1.7

[Drawing 5]

(A)



(B)

締結されたシフト要素

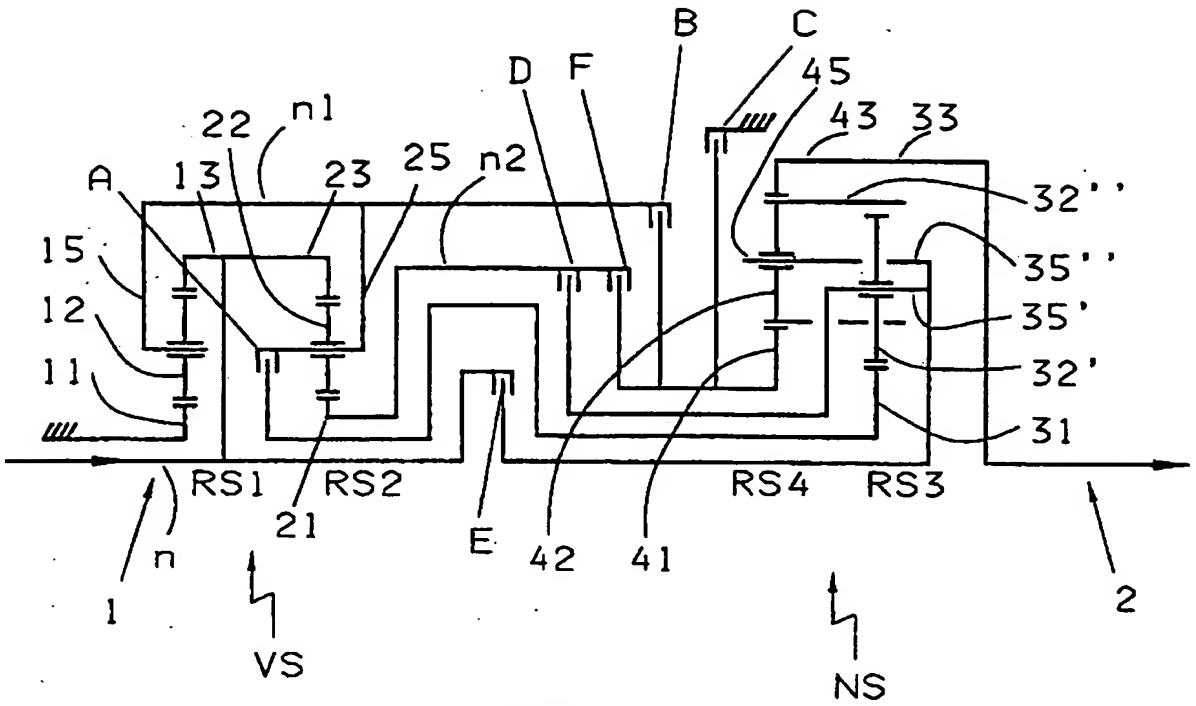
変速段	シフト要素					変速比	変速比間隔(総変速比15)
	A	B	C	D	E		
1			○	○		10.0	2.79
2	○			○		3.59	1.62
3	○		○			2.15	1.46
4	○	○				1.47	1.47
5	○				○	1	1.32
6		○			○	0.76	1.15
7			○		○	0.66	
R		○		○		-9.37	

静止変速比

IO(RS3) = -3.39
IO(RS4) = -2.27
IO(RS1) = -1.5
IO(RS2) = -1.8

[Drawing 6]

(A)



(B)

締結されたシフト要素

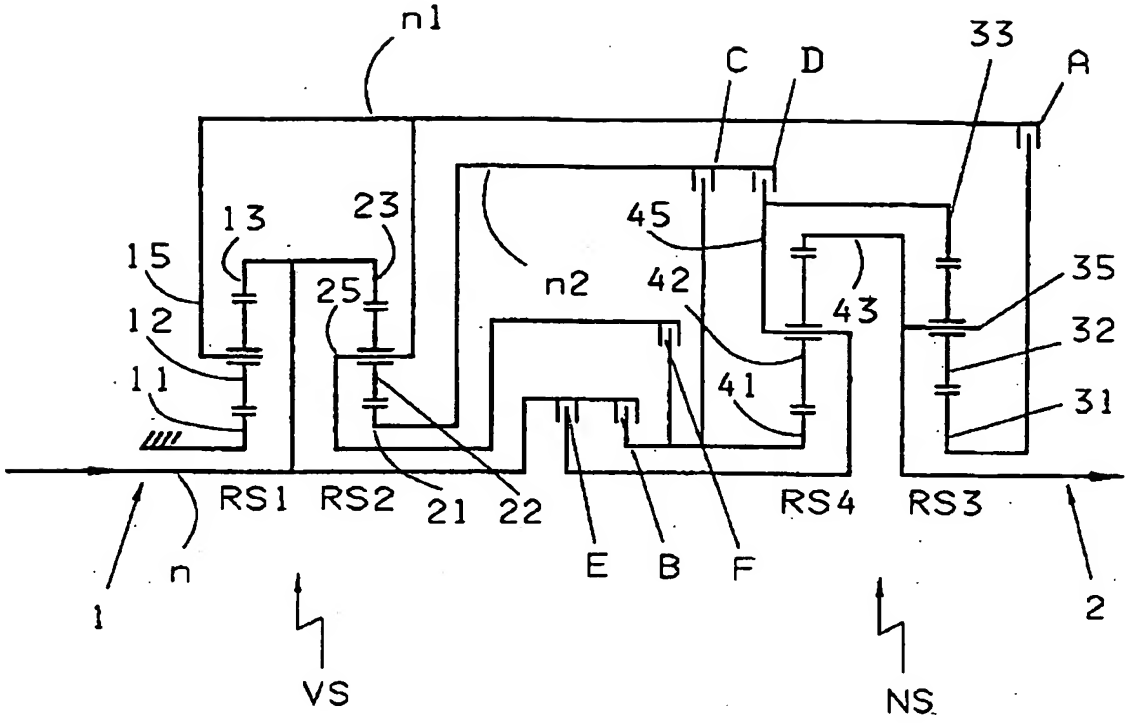
変速段	シフト要素					
	A	B	C	D	E	F
1				○		○
2			○	○		
3	○			○		
4	○		○			
5	○					○
6	○	○				
7	○				○	
8		○			○	
9					○	○
10			○		○	
R		○		○		

静止変速比

I0(RS3) = +2.6
I0(RS4) = -2.0
I0(RS1) = -2.3
I0(RS2) = -1.8

[Drawing 7]

(A)



(B)

締結されたシフト要素

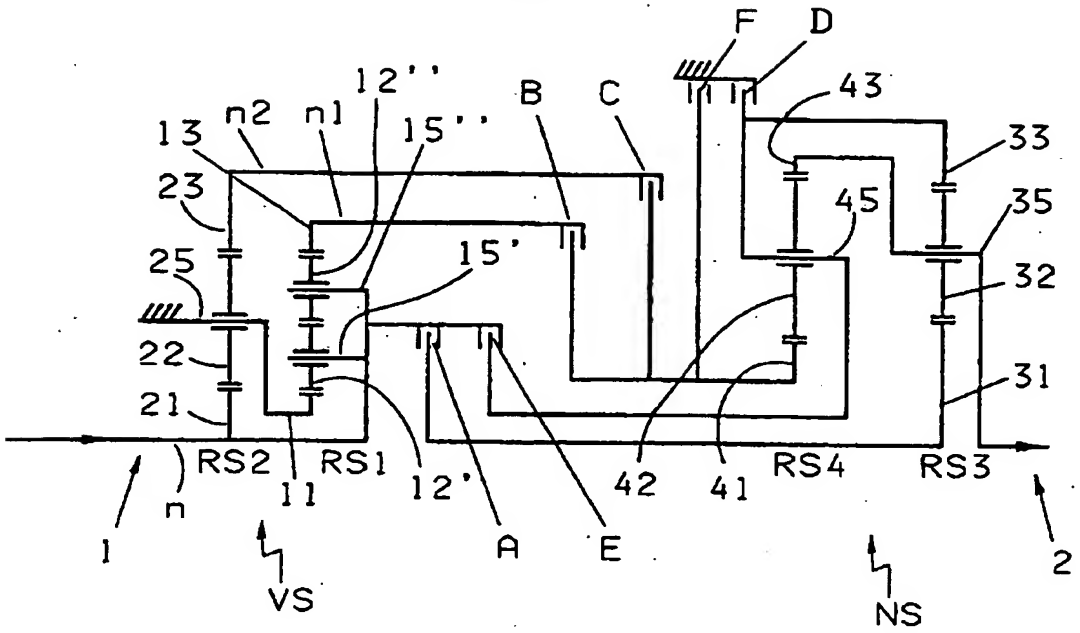
変速段	シフト要素					
	A	B	C	D	E	F
1			○	○		
2	○			○		
3	○		○			
4	○					○
5	○	○				
6	○				○	
7		○			○	
8					○	○
9			○		○	
R1				○		○
R2		○		○		

静止変速比

IO(RS3) = −2.5
IO(RS4) = −3.2
IO(RS1) = −2.2
IO(RS2) = −1.85

[Drawing 8]

(A)



(B)

締結されたシフト要素

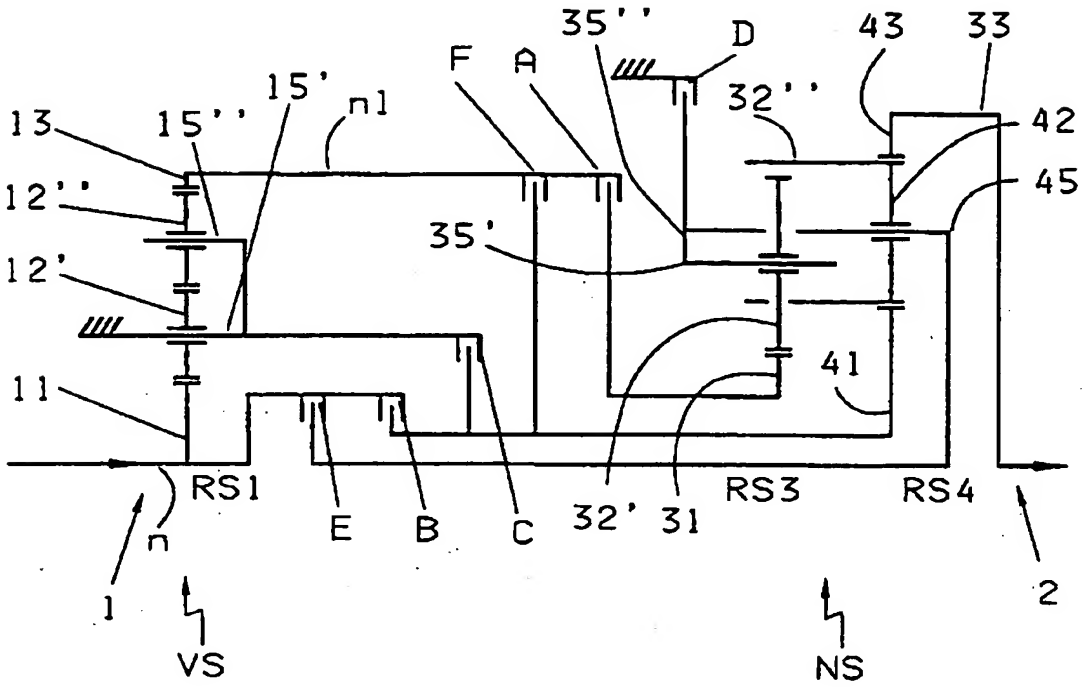
変速段	シフト要素						変速比	変速比間隔 (総変速比9.7)
	A	B	C	D	E	F		
1			○	○			6.52	1.65
2	○			○			3.95	1.50
3	○		○				2.63	1.51
4	○					○	1.74	1.40
5	○	○					1.24	1.24
6	○				○		1	1.15
7		○			○		0.87	1.15
8					○	○	0.75	1.11
9			○		○		0.67	
R		○		○			-5.56	

静止変速比

IO(RS3) = -2.95
IO(RS4) = -3.0
IO(RS1) = +2.17
IO(RS2) = -2.17

[Drawing 9]

(A)



(B)

締結されたシフト要素

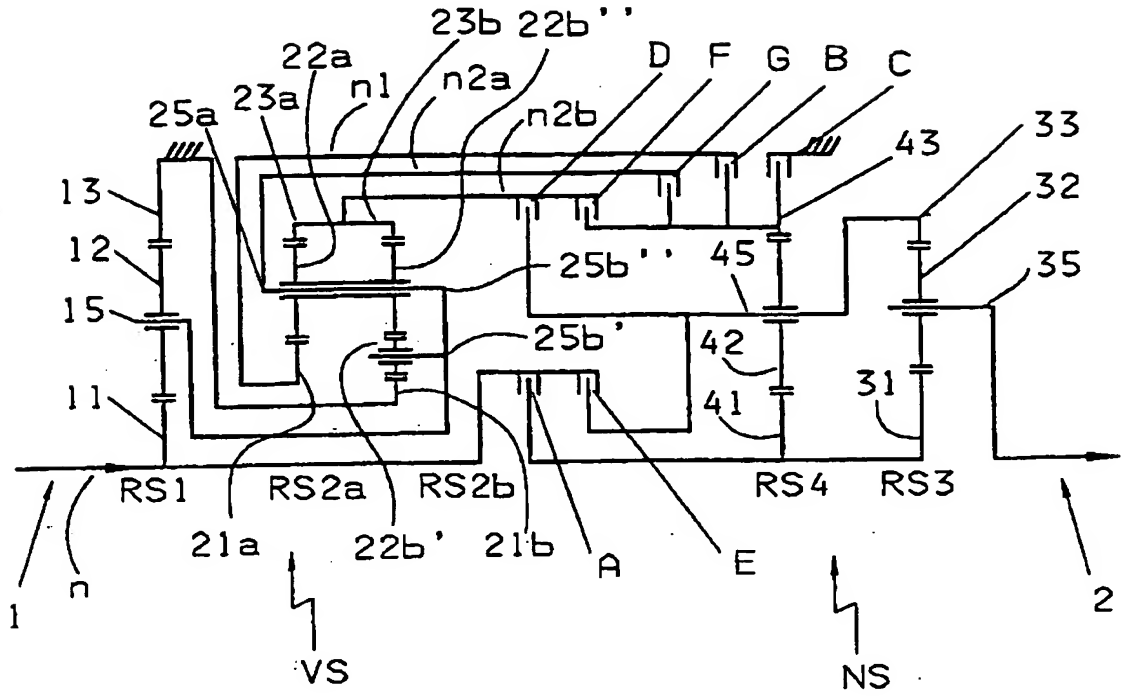
変速段	シフト要素						変速比	変速比間隔 (総変速比9.7)
	A	B	C	D	E	F		
1	o			o			5.43	
2	o		o				3.15	1.72
3	o					o	2.17	1.45
4	o	o					1.59	1.36
5	o				o		1.27	1.25
6		o			o		1	1.27
7					o	o	0.81	1.23
8			o		o		0.70	1.16
R1				o		o	-5.08	
R2		o		o			-2.38	

静止変速比

IO(RS3) = +2.5
IO(RS4) = -2.33
IO(RS1) = +2.17

[Drawing 10]

(A)



(B)

締結されたシフト要素

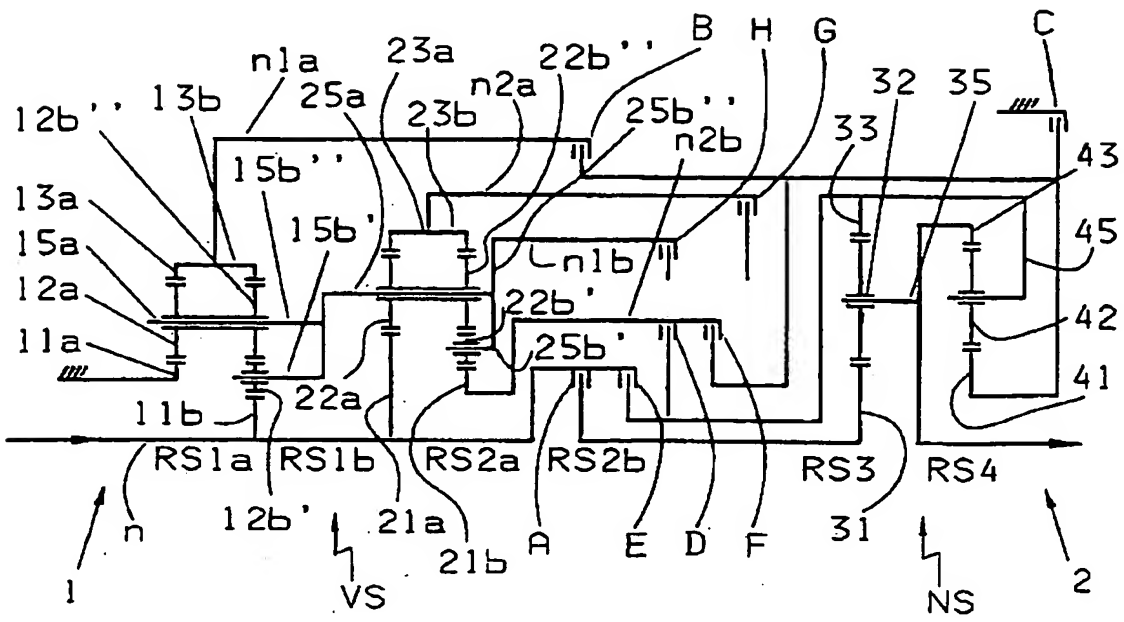
変速段	シフト要素						
	A	B	C	D	E	F	G
1				○			○
2				○		○	
3			○	○			
4	○			○			
5	○		○				
6	○					○	
7	○						○
8	○	○					
9	○				○		
10		○			○		
11					○		○
12					○	○	
13			○		○		
R		○		○			

静止変速比

$i_0(RS3) = -3.4$
$i_0(RS4) = -2.2$
$i_0(RS1) = -2.3$
$i_0(RS2a) = -2.3$
$i_0(RS2b) = +1.8$

[Drawing 11]

(A)



(B)

締結されたシフト要素

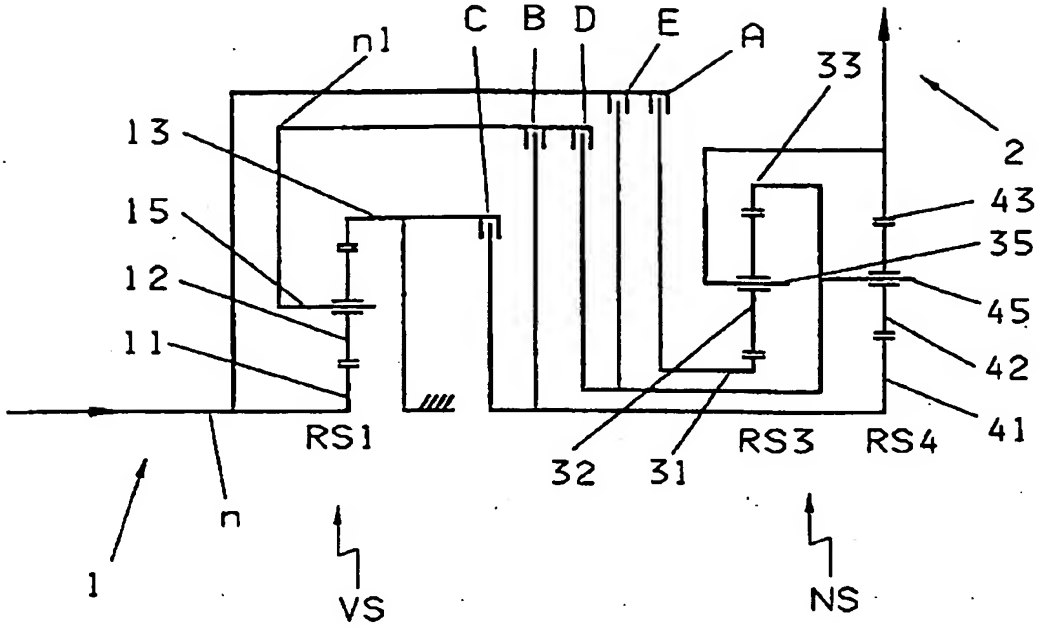
変速段	シフト要素							
	A	B	C	D	E	F	G	H
1				○				○
2				○			○	
3				○		○		
4			○	○				
5	○			○				
6	○		○					
7	○					○		
8	○						○	
9	○							○
10	○	○						
11	○				○			
12		○			○			
13					○			○
14					○		○	
15					○	○		
16			○		○			
R		○		○				

静止変速比

IO(RS3) = −2.8
IO(RS4) = −2.0
IO(RS1a)= −2.0
IO(RS1b)= +2.5
IO(RS2a)= −3.4
IO(RS2b)= +1.6

[Drawing 12]

(A)



(B)

締結されたシフト要素

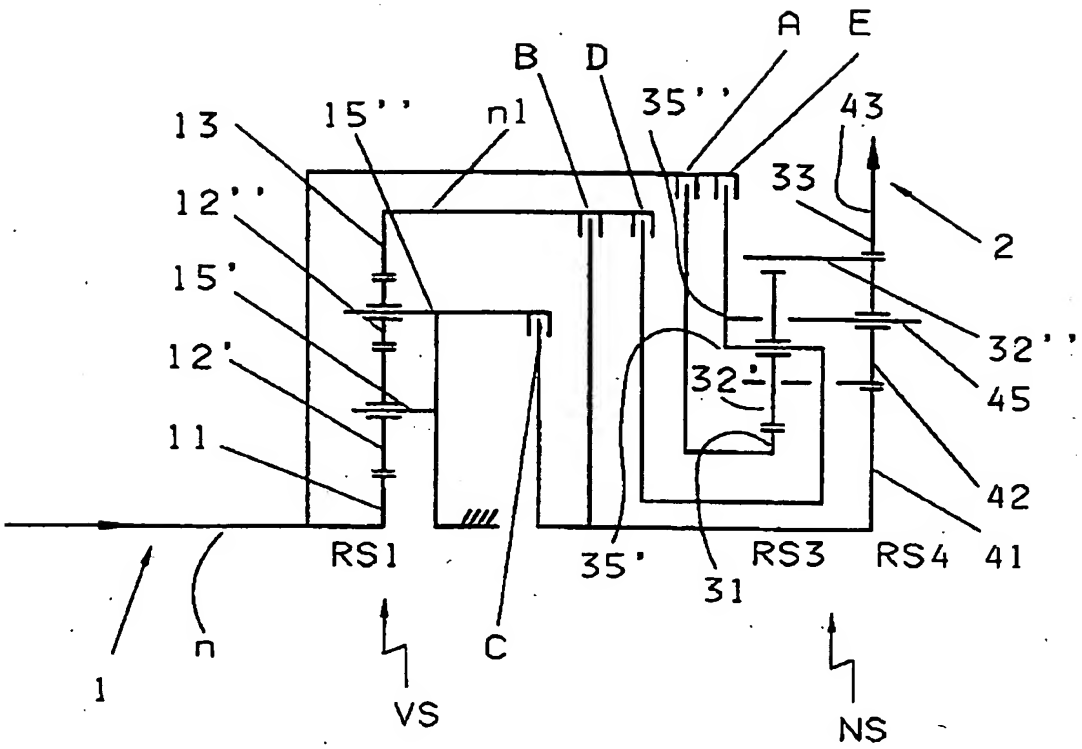
変速段	シフト要素					変速比	変速比間隔（総変速比3.2）
	A	B	C	D	E		
1		○		○		2.5	1.30
2			○	○		1.92	1.20
3	○			○		1.6	1.16
4	○		○			1.38	1.15
5	○	○				1.2	1.20
6	○				○	1	1.18
7		○			○	0.85	1.10
8			○		○	0.77	

静止変速比

IO(RS3) = -1.7
IO(RS4) = -3.3
IO(RS1) = -1.5

[Drawing 13]

(A)



(B)

締結されたシフト要素

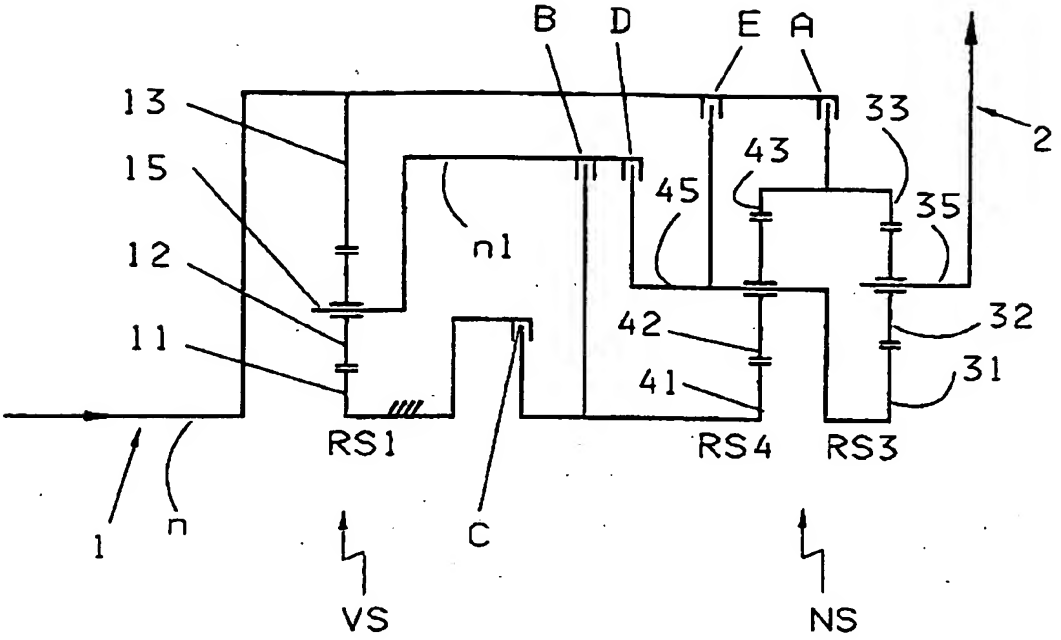
変速段	シフト要素					変速比	変速比間隔 (総変速比2.7)
	A	B	C	D	E		
1		○		○		2.0	1.33
2			○	○		1.5	1.25
3	○			○		1.2	1.06
4	○		○			1.13	1.07
5	○	○				1.06	1.06
6	○				○	1	1.16
7		○			○	0.86	1.15
8			○		○	0.75	

静止変速比

IO(RS3) = +1.5
IO(RS4) = -3.0
IO(RS1) = +2.0

[Drawing 14]

(A)



(B)

締結されたシフト要素

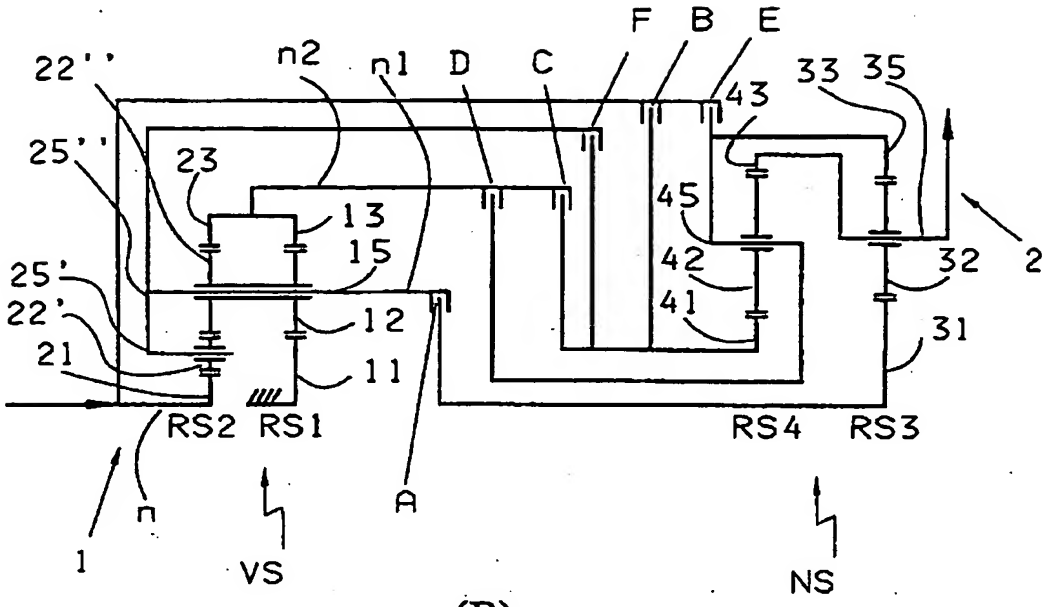
変速段	シフト要素					変速比	変速比間隔（総変速比2.0）
	A	B	C	D	E		
1		○		○		1.67	1.21
2			○	○		1.38	1.18
3	○			○		1.17	1.06
4	○		○			1.10	1.06
5	○	○				1.04	1.04
6	○				○	1	1.09
7		○			○	0.92	1.11
8			○		○	0.83	

静止変速比

IO(RS3) = −1.75
IO(RS4) = −3.0
IO(RS1) = −1.5

[Drawing 15]

(A)



(B)

締結されたシフト要素

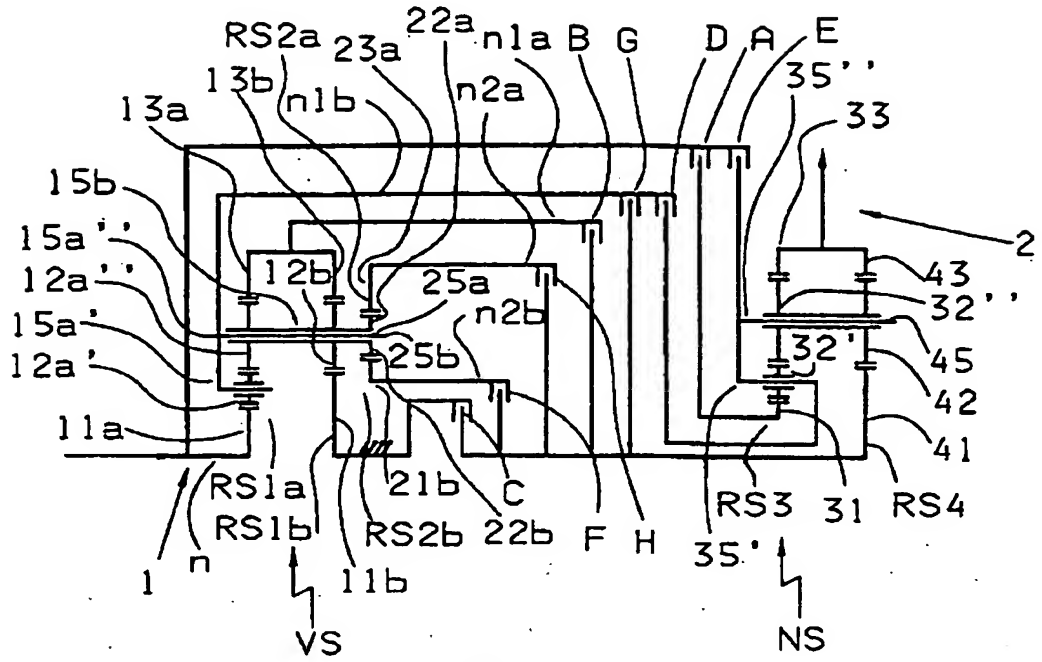
変速段	シフト要素						変速比	変速比間隔 (総変速比4.1)
	A	B	C	D	E	F		
1		○		○			3.28	1.36
2				○		○	2.41	1.30
3			○	○			1.86	1.15
4	○			○			1.62	1.11
5	○		○				1.46	1.14
6	○					○	1.28	1.11
7	○	○					1.15	1.07
8	○				○		1.08	1.08
9		○		○	○		1	1.11
10				○	○	○	0.90	1.11
11			○		○		0.81	

静止変速比

IO(RS3) = −2.0
IO(RS4) = −2.0
IO(RS1) = −2.2
IO(RS2) = +1.9

[Drawing 16]

(A)



(B)

締結されたシフト要素

変速段	シフト要素							
	A	B	C	D	E	F	G	H
1		o		o				
2				o				o
3				o			o	
4				o		o		
5			o	o				
6	o			o				
7	o		o					
8	o					o		
9	o						o	
10	o							o
11	o	o						
12	o				o			
13		o			o			
14					o			o
15					o		o	
16			o		o	o		
17		o		o	o			

静止変速比

I0(RS3) = +2.0
I0(RS4) = −2.4
I0(RS1a)= +2.0
I0(RS1b)= −1.5
I2b/22a,b= 1.75

[Translation done.]